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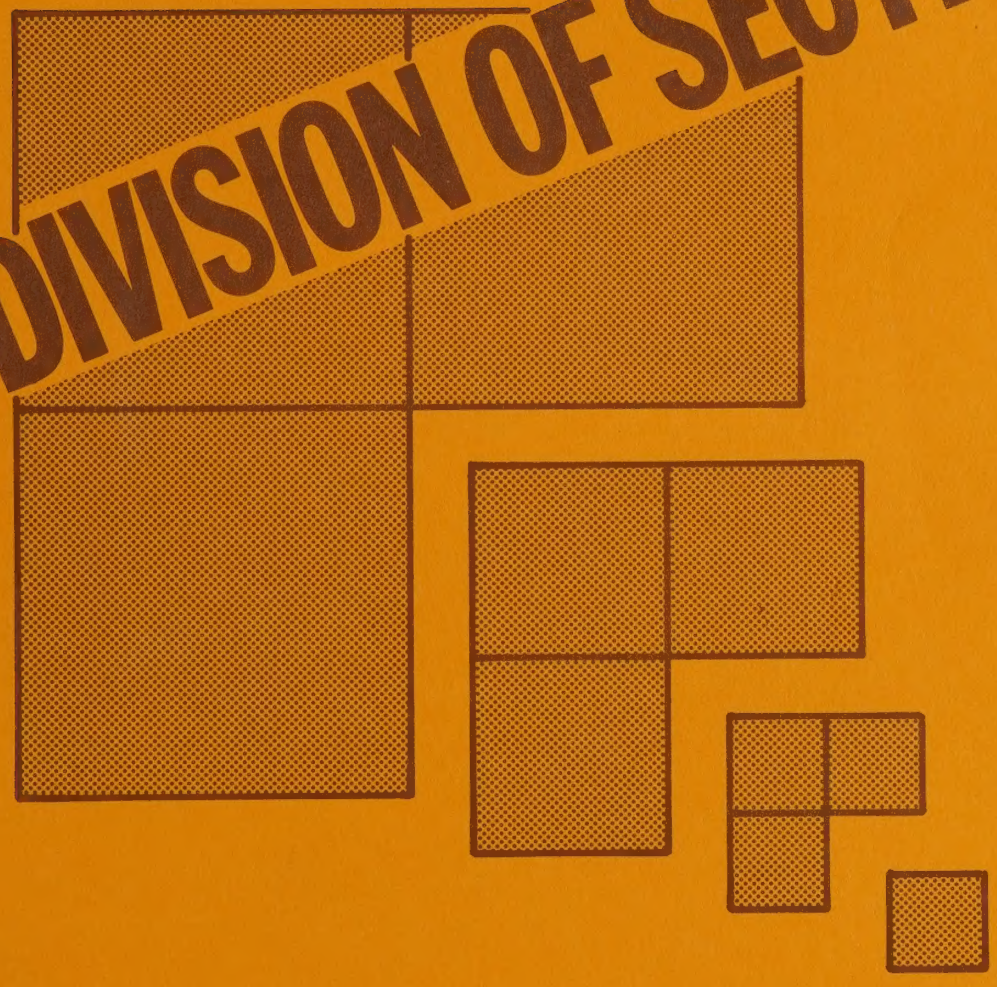

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Course No. 9600 - ST - 25

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of this department of natural resources.

The Department works to assure the wisest choice in managing all our resources so that each shall make its full contribution to a better United States now and in the future.

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SUBDIVISION OF SECTIONS

COURSE NUMBER 9600-ST-25

1980

PREPARED BY

THE CADASTRAL AND MAPPING TRAINING STAFF

BUREAU OF LAND MANAGEMENT

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INSTRUCTIONS

This workbook was designed for use with the A/V program, "Subdivision of Sections." It contains a summary of the material presented by slide and tape, additional illustrative material, and exercises to be worked by the student. It is not intended to be complete in itself. The exercises are intended to be more learning than testing situations.

START — Each reel of this two-reel program consists of two slide carousels and one sound cassette. There are two types of dual projectors designed to be used with cadastral and mapping training courses, the Singer Caramate, and the Bell & Howell Ringmaster.

Once you understand how to operate your particular type (be sure to seek help if you are in doubt), load the carousels and cassette and begin.

STOP — There are pauses built into the program at the end of almost every slide. These are quite short and geared for speedy review. Before each set of slides is changed, an audible cue will be heard.

The program will stop after this cue if you are using the Singer Caramate. If you are using the Bell & Howell Ringmaster, you will have to stop the program yourself whenever you need a longer time to view a particular set of slides. In either case simply move on to the next slide when you are ready.

REVIEW — If you wish to review previous material, rewind the tape to the desired point in the program and then rotate the carousel until slide and narration are synchronized.

END OF REEL — Rewind the sound cassette and rotate the slide carousels to zero. Remove both and turn the power off on both machines unless you are going to continue immediately.

OBJECTIVES

Upon completion of this course, the student should know:

1. The Acts of Congress that are the legal basis for the present method of subdividing sections.

2. The past and present policies and practices of the Bureau of Land Management in subdividing sections.

3. The preliminary searches and surveys necessary before the actual subdivision begins.

4. How to subdivide regular and fractional sections as well as those sections that lie along the north and west boundaries of a township.

For reference during the program and the exercises the student should have on hand: The Manual of Instructions for the Survey of the Public Lands of the United States, 1973, and Restoration of Lost or Obliterated Corners and Subdivision of Sections. Other references are given at the end of this workbook.

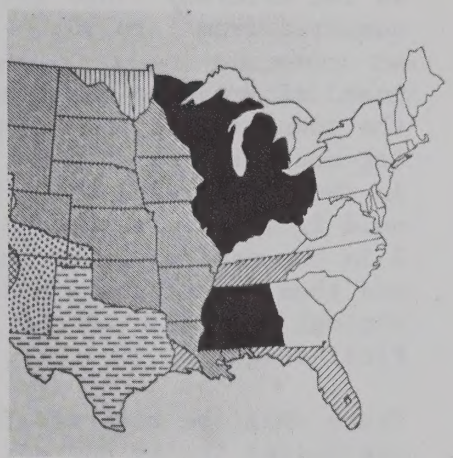
Pen, paper, and a straight edge are needed.

Read over the Glossary before beginning; then come back to it during the program when terms need clarification.

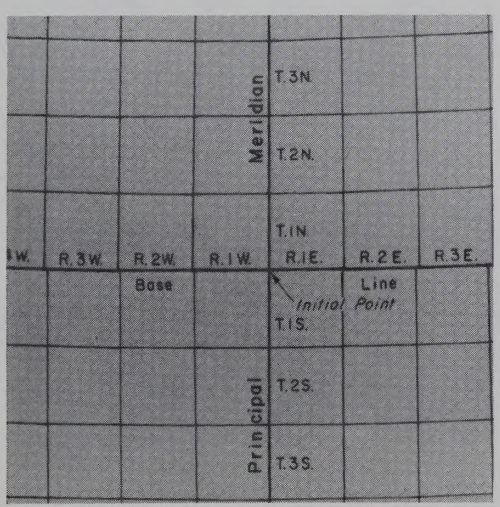
I. HISTORICAL DEVELOPMENT -- EARLY ACTS OF CONGRESS

The fundamental necessity of Federal ownership of lands not included within the boundaries of the several states was early recognized and took form under a resolution of the Congress of the Confederation passed October 10, 1780. This resolution provided for the reception and care of such unappropriated lands as might be ceded by the states to the United States, and for the disposition of such lands for the common good. In pursuance of this policy, cessions were made between 1781 and 1802 by seven states -- New York, Virginia, Massachusetts, Connecticut, South Carolina, North Carolina, and Georgia -- of an area amounting to 259,171,787 acres of land. The transfers were the origin of the public domain. A foundation was thus laid for a common ownership to be exercised on behalf of the entire Nation. (Shalowitz, 1964, p. 441-2).

Congress's early concern with the public land was its sale to raise immediate and much-needed revenue. Later Congress became more interested in the orderly settlement and development of the frontier and for this purpose gave away vast areas.



Sale or grant -- In either case, a simple method of identifying and describing these lands was needed.



Result -- Developing the Rectangular System of surveying public lands.

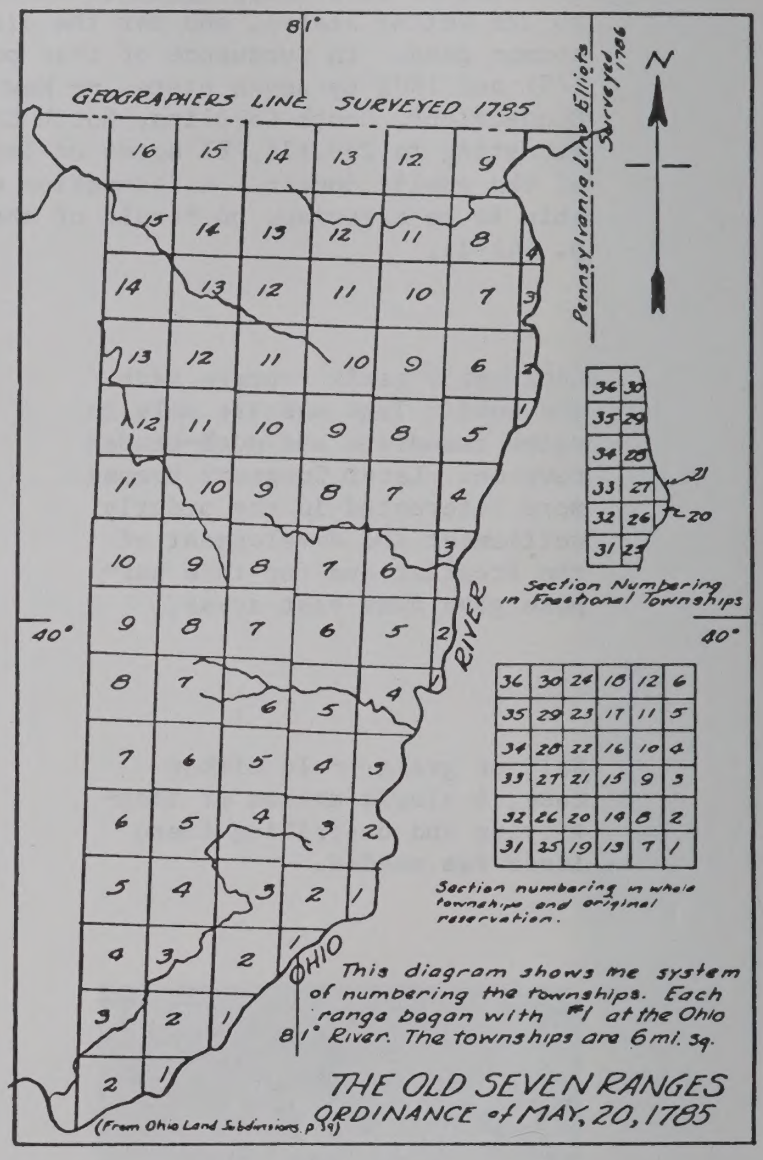
Ordinance of May 20, 1785 - An Ordinance for ascertaining the mode of disposing of lands in the western territory.

Surveyors shall divide the said territory into townships of six miles square by lines running due north and south and others crossing them at right angles.

Township plats shall be marked by subdivisions into lots one mile square, or 640 acres, in the same direction as the external lines and numbered from 1 to 36.

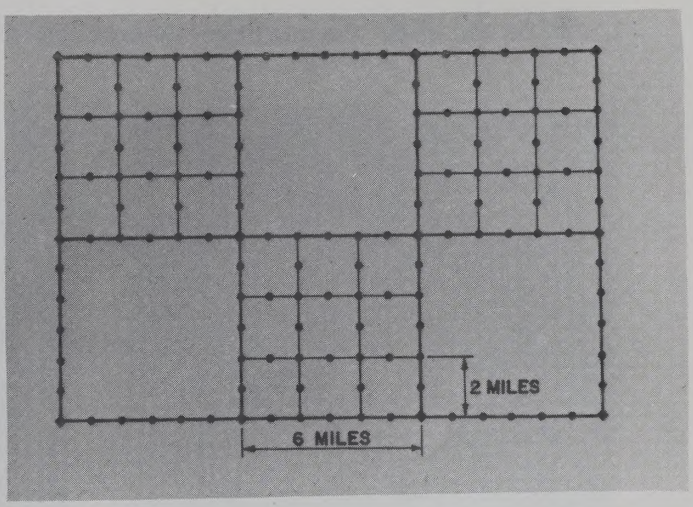
Board of Treasury shall sell the townships in the following manner: township No. 1 in the first range shall be sold in its entirety, and No. 2 in the same range by lots, and thus in alternate order through the whole of the first range.

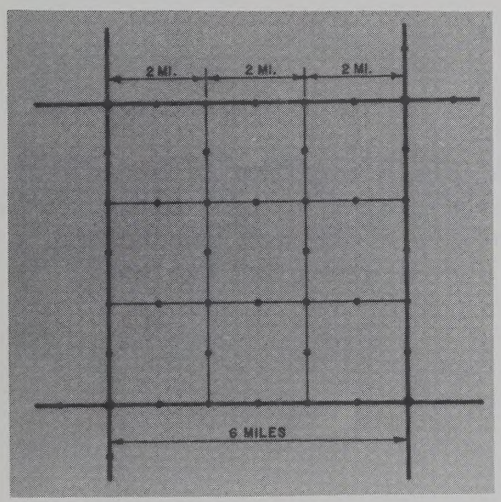
There shall be reserved for the United States out of every township the four lots numbered 8, 11, 26, and 29 for future sale. There shall be reserved lot No. 16 of every township for the maintenance of public schools.


81°
GEOGRAPHERS LINE SURVEYED 1785
Pennsylvania Line Elliots Surveyed 1786
N
Section Numbering in Fractional Townships
40°
RIVER
OHIO
81°
Section numbering in whole townships and original reservation.
This diagram shows the system of numbering the townships. Each range began with #1 at the Ohio River. The townships are 6 mi. sq.
THE OLD SEVEN RANGES
ORDINANCE of MAY, 20, 1785
(From Ohio Land Subdivisions p. 34)

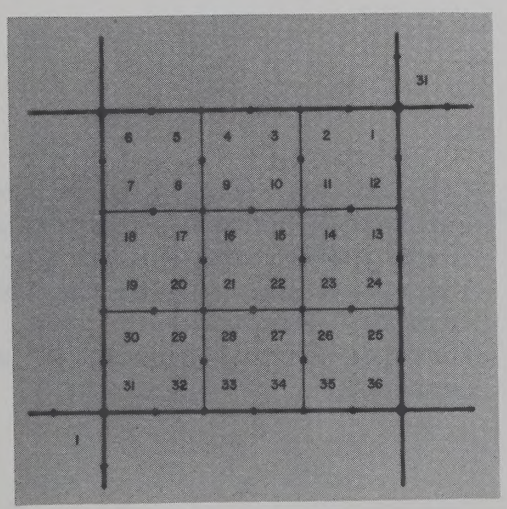
The Act of May 18, 1796 - "An Act providing for the Sale of the Lands of the United States, in the territory northwest of the river Ohio, and above the mouth of the Kentucky River."

Lines run according to true meridian, forming townships six miles square. Alternate townships divided into 36 sections, containing 640 acres, "as nearly as may be."



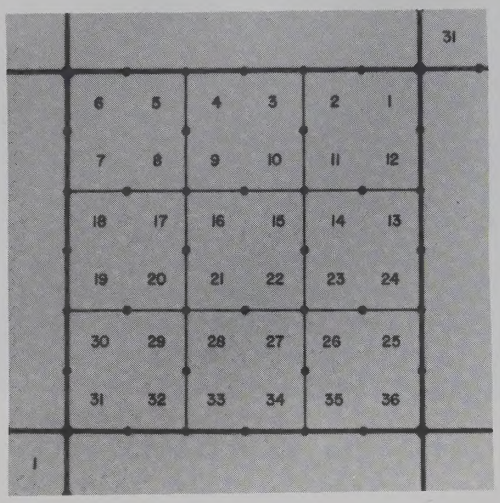


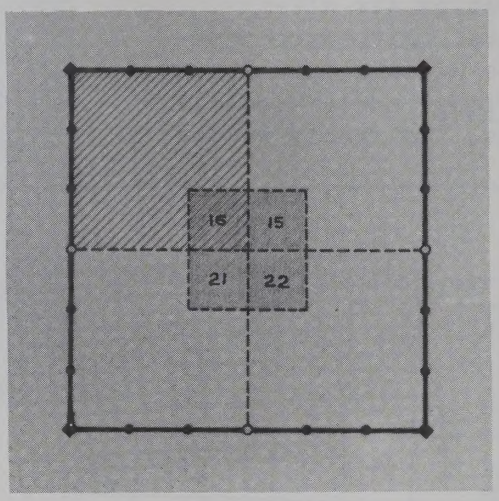
Section lines run every two miles; corners marked every mile.



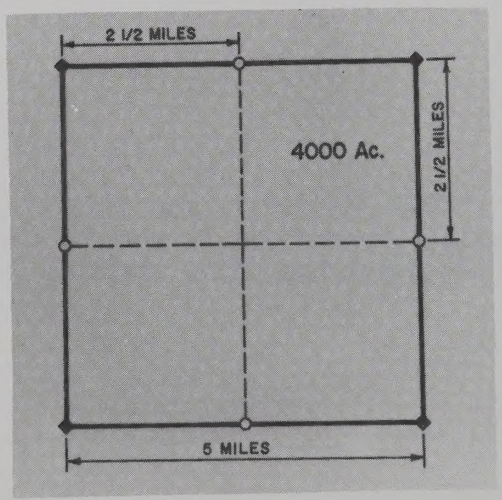
Sections numbered as shown.

Land to be sold in quarter-townships and in sections.



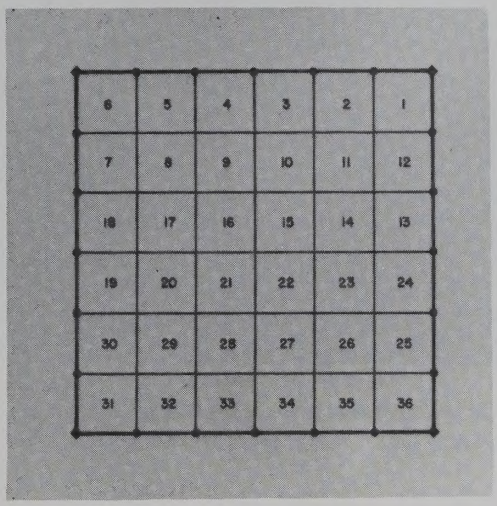


The Act of March 1, 1800. An Act in addition to an Act entitled, "An Act regulating the grants of land appropriated for Military Services, and for the Society of the United Brethern for Propagating the Gospel among the heathen."



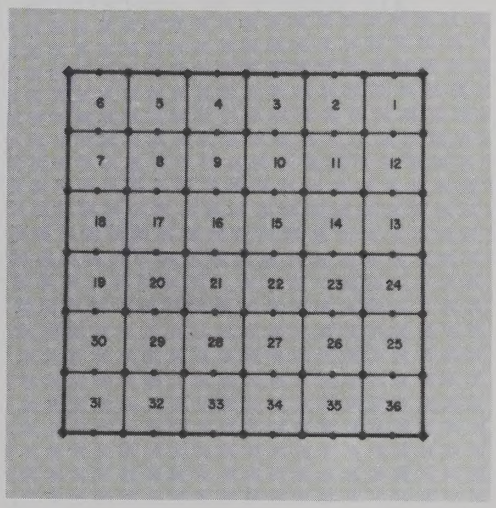
Corners set contrary to record still true corners. Five-mile townships divided by straight lines between opposite quarter corners. Areas returned by Surveyor-General considered as correct.

The Act of May 10, 1800, - An Act to amend the Act of 1796.

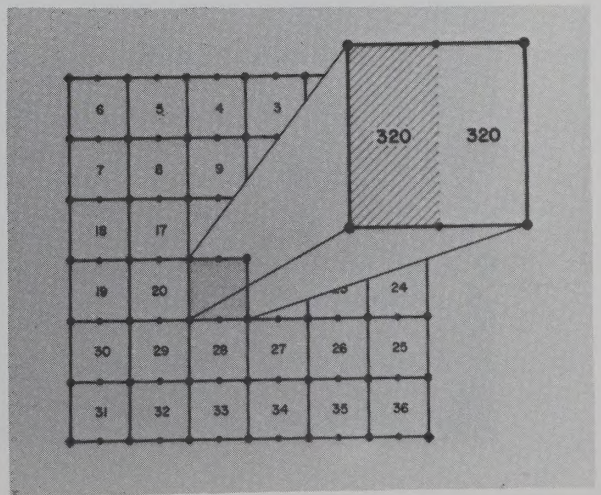


Section lines run one mile apart.

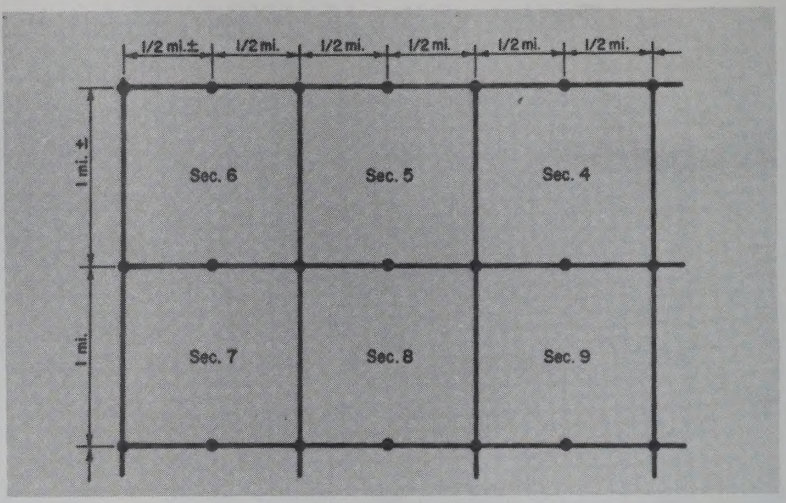
Corners marked one mile apart on north-south lines and one-half mile apart on east-west lines.



Sale of half-sections authorized.

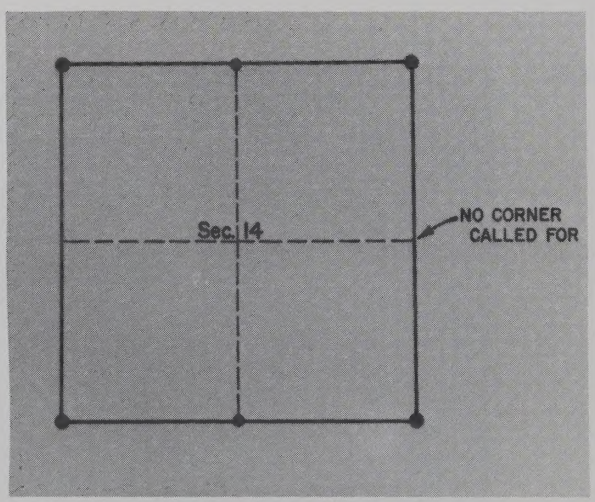


Excess or deficency to go into last half-mile closing on township or range lines.



Once again: Sections and half-sections along the northern and western township lines to be sold as containing only the quantities returned; all others as containing the legal quantity.

The Act of March 26, 1804. An Act making provision for the disposal of the public lands in the Indiana territory and for other purposes.



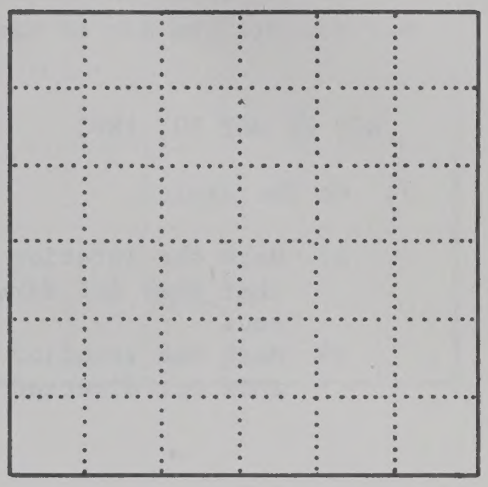
Sections divided in half by a line joining opposite half-mile corners. Half-sections subdivided into quarters by an indeterminate east-west lines. Sale of land extending to quarter-sections.

Exercise I

ORDINANCE OF 1785

1. On the sketch,

   a) Mark those sections which have the same number according to the Ordinance and according to present instructions.
   b) Mark all the interior section lines that the Ordinance directed to be run.
   c) Mark all the corners that the Ordinance directed to be set.



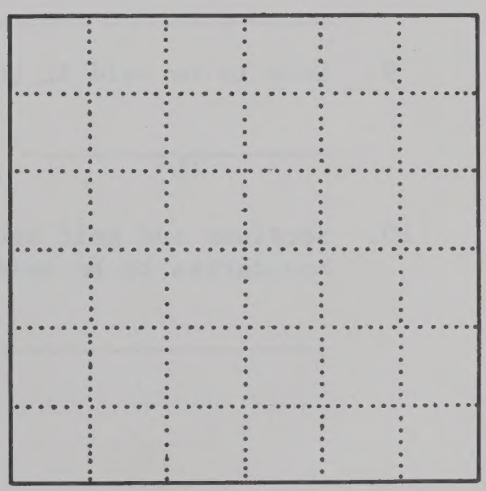
2. What is wrong with Thomas Hutchin's map of the Seven Ranges? (See slide 15, reel A.)

3. Land to be sold in quantities of _____ and
   (a)
   _____.
   (b)

ACT OF 1796

4. On the sketch,

   a) Mark the interior section lines that this Act directed to be run.
   b) Mark the interior corners that this Act directed to be set.



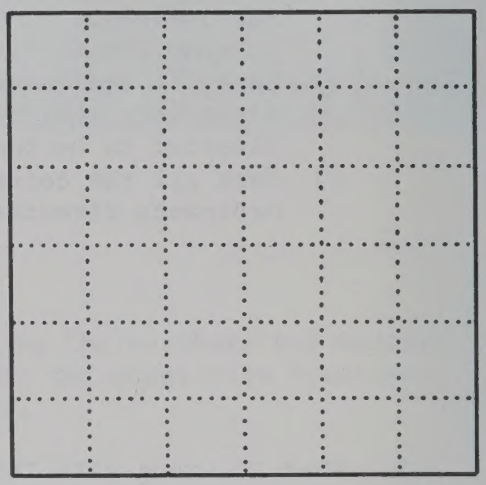
5. Land to be sold in quantities of _____ (a) and _____ (b).

6. How did the Act of March 1, 1800, direct townships to be divided?

ACT OF MAY 10, 1800

7. On the sketch,

   a) Mark the interior section lines that this Act directed to be run.
   b) Mark the interior corners that this Act directed to be set.

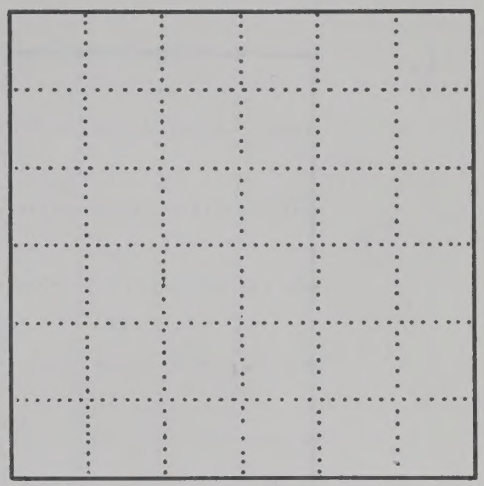


8. This Act directs that the excess or deficiency of lines closing on north township boundaries be placed _____.

9. Land to be sold in quantities of _____ (a) and _____ (b).

10. Sections and half sections along the north and west township boundaries to be sold as containing the quantity _____.

11. On the sketch, mark any interior corners called for in this Act.

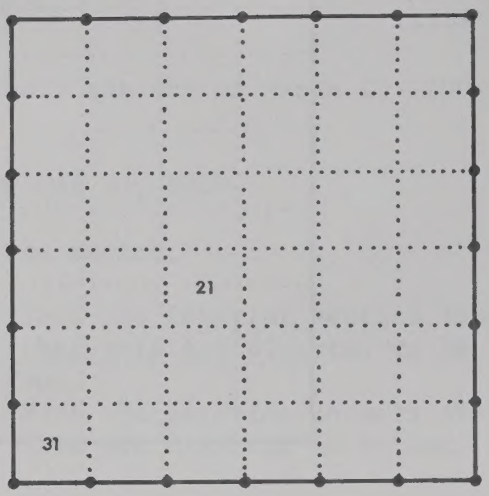


12. What corners determine the location of the east-west line that divides the section into quarters?

13. Land to be sold in quantities of _____(a)_____, _____(b)_____, _____(c)_____.

Answers to Exercise I

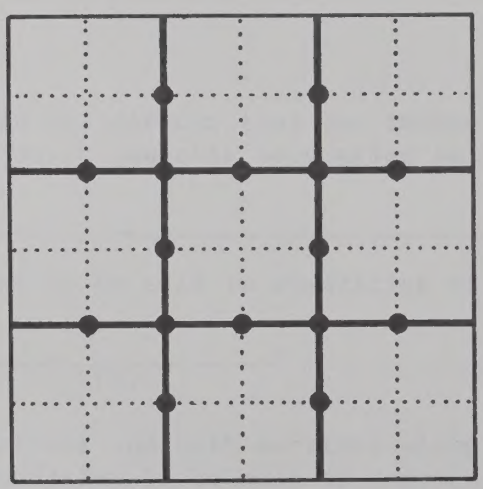
1.



2. TOWNSHIPS (a) and LOTS (b)

3. Thomas Hutchin's map indicates that lots 15, 16, 21, and 22 were reserved. These lots were reserved in future acts, but the Ordinance of 1785 reserved lots 8, 11, 26, and 29 for the United States.

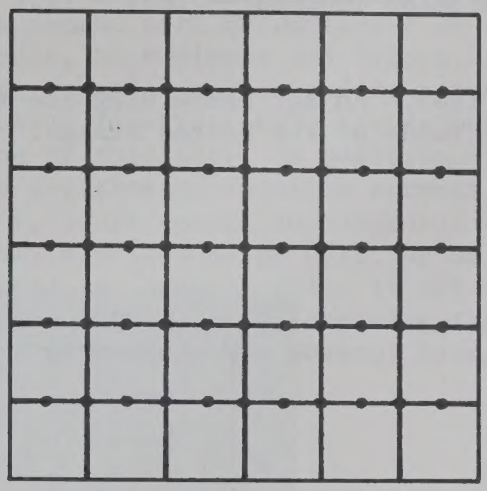
4.



5. QUARTER TOWNSHIPS (a) and SECTIONS (b)

6. By boundary line joining opposite quarter-township corners.

7.

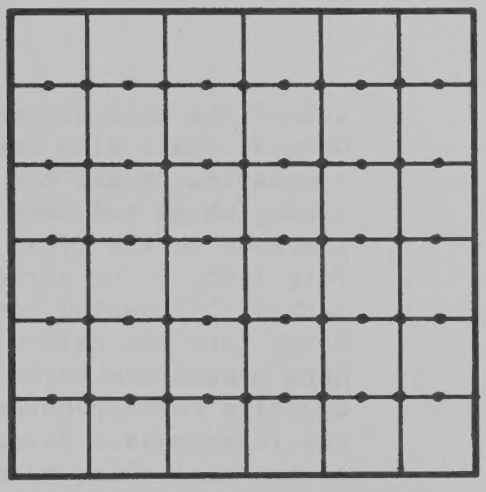


8. in the last mile.

9. SECTIONS (a) and HALF SECTIONS (b)

10. "expressed in the returns and plats."

11. No additional corners called for in this Act.



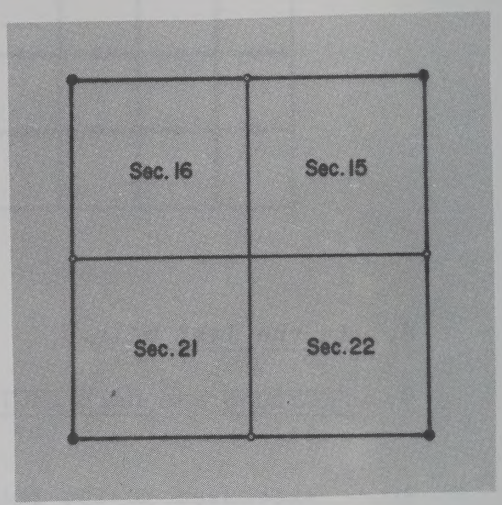
12. None. Though the Act called for an east-west dividing line, it did not give any directions for locating that line.

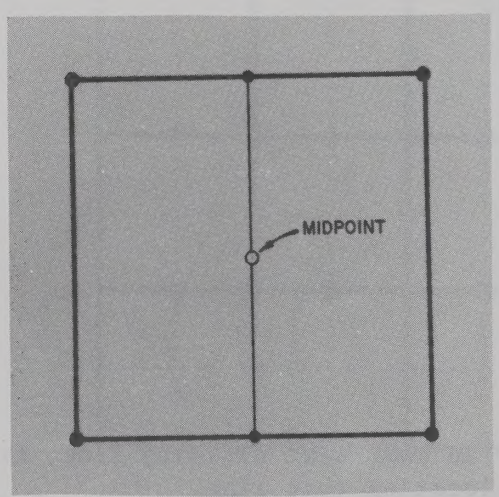
13. SECTIONS (a), HALF SECTIONS (b) and QUARTER SECTIONS (c)

II. CONGRESS'S FINISHING TOUCHES -- 1805 - 1832

An Act of February 11, 1805. An Act concerning the mode of surveying the public lands of the United States.

...the Surveyor General shall cause all those lands north of the river Ohio, which were subdivided by running through the townships parallel lines each way, at the end of every two miles, and by marking a corner on each of the said lines, at the end of every mile; to be subdivided into sections by running straight lines from the mile corners thus marked, to the opposite corresponding corners, and by marking on each of the said lines, intermediate corners as nearly as possible equidistant from the corners of the sections on the same.





...And the said Surveyor General shall also cause the boundaries of all the half sections, which had been purchased previous to the first day of July last, to be surveyed and marked, by running straight lines from the half-mile corners heretofore marked to the opposite corresponding corners; and intermediate corners shall, at the same time, be marked on each of the said dividing lines, as nearly as possible equidistant from the corners of the half section on the same line...

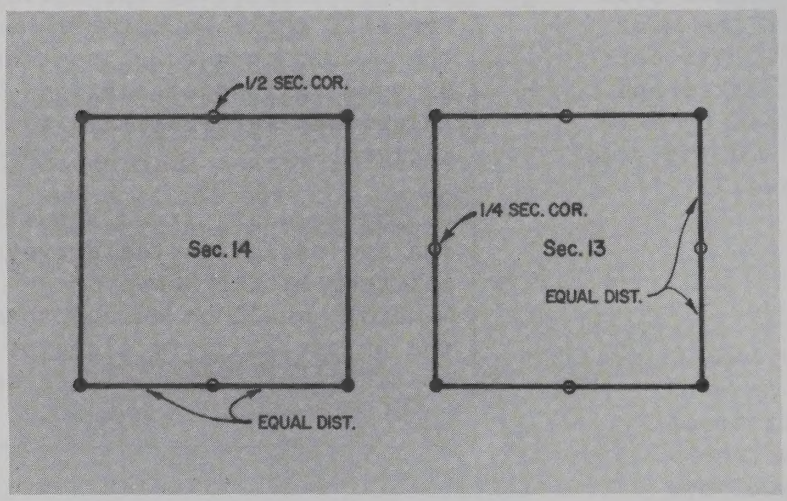
The entire first section of the Act of 1805 was superfluous. Later on in the second part of Section 2 of the same Act, Congress gave a general rule, both simple and direct, for determining boundary lines by joining opposite corresponding corners. This rule would have been sufficient to effectively divide both parcels mentioned in the first section of this Act. In addition, this latter rule leaves no doubt as to the position of interior corners, whereas the former, if taken literally, could result in redundant corners. The first Section was probably mischievous as well; by setting forth procedures that contradicted the general rule, it may well have been responsible for the different methods of determining the center of Section advanced both within and outside the General Land Office in the middle of the 19th Century.

In a more serious vein, Congress laid down some fundamental principles beginning with the most important one of all. All corners and boundaries marked and run in surveys returned by duly appointed surveyors are the true corners and boundaries.

> ...All the corners marked in the survey returned by the Surveyor-General, shall be established as the proper corners of sections, or subdivisions of sections, which they were intended to designate...
>
> ...The boundary lines actually run and marked in the surveys returned by the Surveyor-General, shall be established as the proper boundary lines of the sections, or subdivisions, for which they were intended...

On the 13 of March 1805, approximately one month after the Act of 1805 was enacted into law, Albert Gallatin, Secretary of the Treasury, whose Department was responsible for the public land surveys, wrote of this Act:

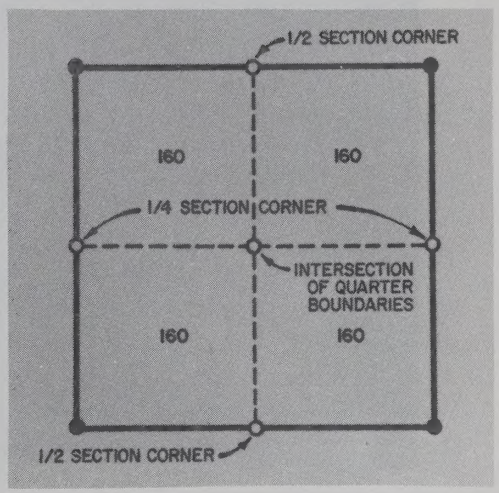
> You will also perceive, from the enclosed Act, that the principal object which Congress has in view is that the corners and boundaries of the sections and subdivisions of sections should be definitely fixed, and that the ascertainment of the precise contents is not considered as equally important. Indeed, it is not so material, either for the United States or for the individuals, that the purchasers should actually hold a few acres more or less than their surveys should call for, as it is that they should know with precision and so as to avoid any litigation, what are the certain boundaries of their tract.

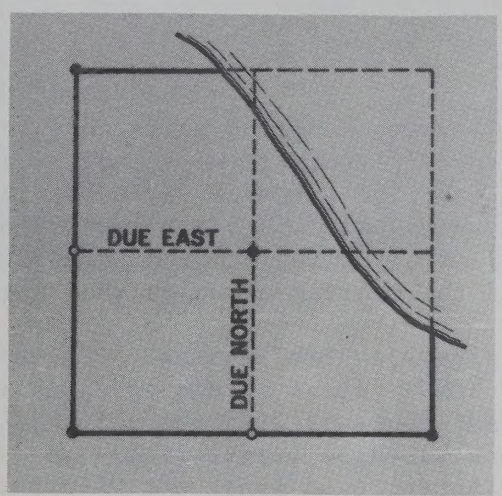


Corners of half- and quarter-sections are to be set on line and midway between the two section corners.

This Act makes no exception for corners on the last mile along north and west township boundaries. But the interpretation of the Surveyor-Generals of that time, which became the policy of the General Land Office, was that the Act of May 10, 1800, was not superseded by the Act of 1805 despite the statement in Section 2 of that Act about "any act or acts to the contrary notwithstanding."

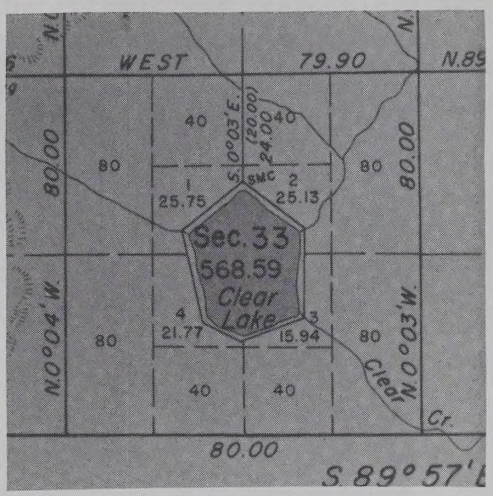
Boundary lines not actually surveyed to be located by running straight lines from established corners to opposite corresponding corners. Thus are the boundaries of half-sections and quarter-sections determined.





Where there is no opposite corresponding corner, the half- and quarter-section boundaries are to be cardinal.

The center of section or a corner common to the four quarters of a section is never mentioned in the Act of 1805. Its existence is implicit in the definition of the interior boundaries and the fact that these boundary lines do intersect at one point.

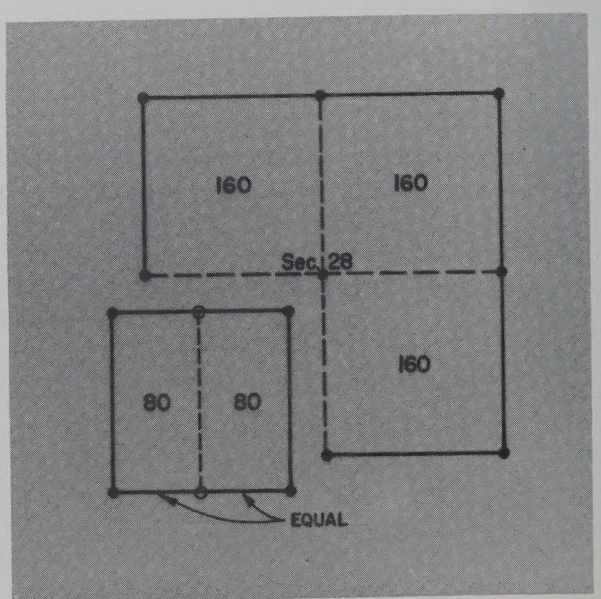


Finally, the lengths of lines and the area quantities returned by the Surveyor-General are to be held as the true lengths and quantities.

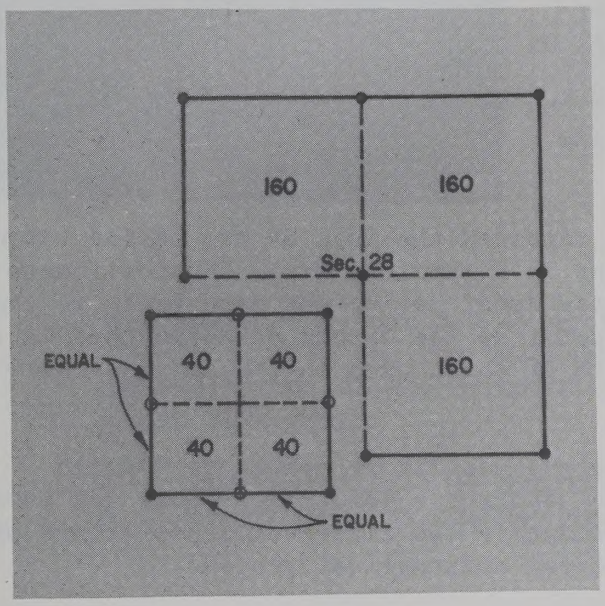
That part of the Act of 1805 referring to the areas of half- and quarter-sections has never been interpreted literally when the concerned sections are not regular. Thus, for instance, in a section along the north boundary, those areas which have not been returned are held to contain one-fourth (160 acres) of a regular section, not one-fourth of the returned contents of the section of which they make part.

Act of April 24, 1820 - An Act making further provision for the sale of the public lands.

...and in every case of the division of a quarter section, the line for the division thereof shall run north and south, and the corners and contents of half quarter sections shall be ascertained in the manner, and on the principles directed and prescribed by the second section of an act passed on the eleventh day of February, eighteen hundred and five...



Act of April 5, 1832 - An Act supplementary to the several laws for the sale of public lands.

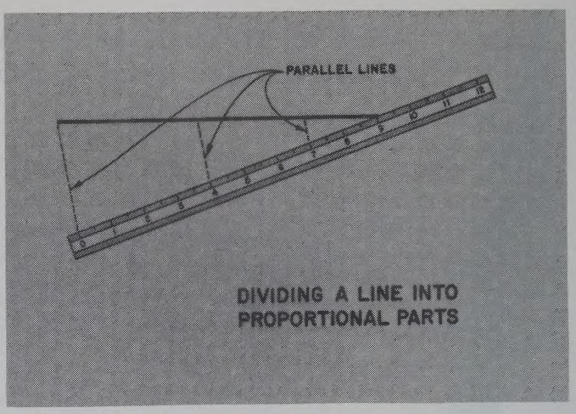


...and in every case of a division of a half-quarter section, the line for the division thereof shall run east and west, and the corners and contents of quarter-quarter sections shall be ascertained in the manner, and on the principles, directed and prescribed by the second section of an act, passed on the eleventh day of February, eighteen hundred and five...

After 1832 Congress did not again concern itself with the manner of dividing the public lands. What had been set forth in the Acts of 1805, 1820, and 1832 remained the basic law for surveying these lands. However, instruments, methods, and interpretation of the law have changed as the years have passed.

For example, the Act of 1805 reads: "The length of such lines as returned by the Surveyor-General shall be held and considered as the true length thereof." Yet in practice, surveyors find that the lengths they measure differ, sometimes considerably, from those of the record.

At first, retracing surveyors merely shortened or lengthened their chains to measure the same lengths as the original surveyors measured with their chains. Missing corners could then be set at record distances. You do something similar when you divide a line into equal or proportionate parts. You merely shorten or lengthen each unit of the scale until it fits the line being divided.



DIVIDING A LINE INTO PROPORTIONAL PARTS

The 1896 "Restoration" Circular retained the idea of two chains but no longer related them to each other in a physical way. "Proportionate measurement," it said, "is a measurement having the same ratio to that recorded in the original field notes as the length of chain used in the new measurement has to the length of chain used in the original survey."

The 1930 and 1947 Manual make only a passing reference to the old practice of "adjusting the chain" while the 1973 Manual does not even mention it. The necessity to reconcile two different measurements of the same line has become an abstract mathematical process.

Exercise II

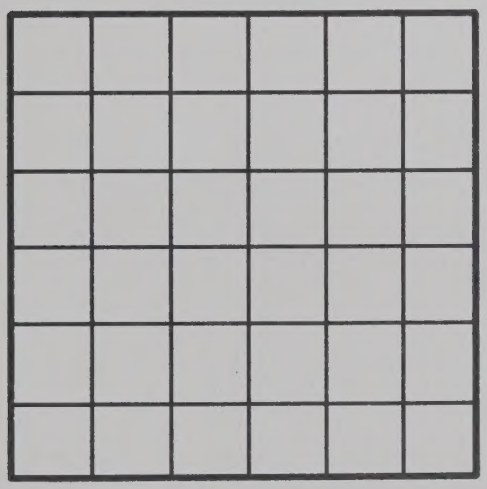
ACT OF 1805

1. The first part of this Act gives instructions on how to divide a section into half sections. How do these instructions differ from the instructions of the Act of March 26, 1804, dealing with the same subject?

2. "The question is not how an entirely accurate survey would locate these lots, but how the original stakes located them; otherwise the visitation of the surveyor might well be set down as a great public calamity."

   What important principle did this Act set forth to avoid just such "calamaties" as the New Mexico judge spoke of in the above quotation?

3. On the sketch mark any interior corners called for in this Act but not provided for by previous acts.



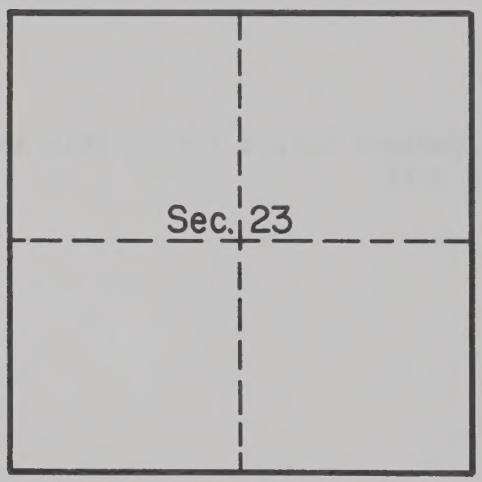
4. What does this Act say about where to set half-section corners on the last mile of lines closing on north and west township boundaries?

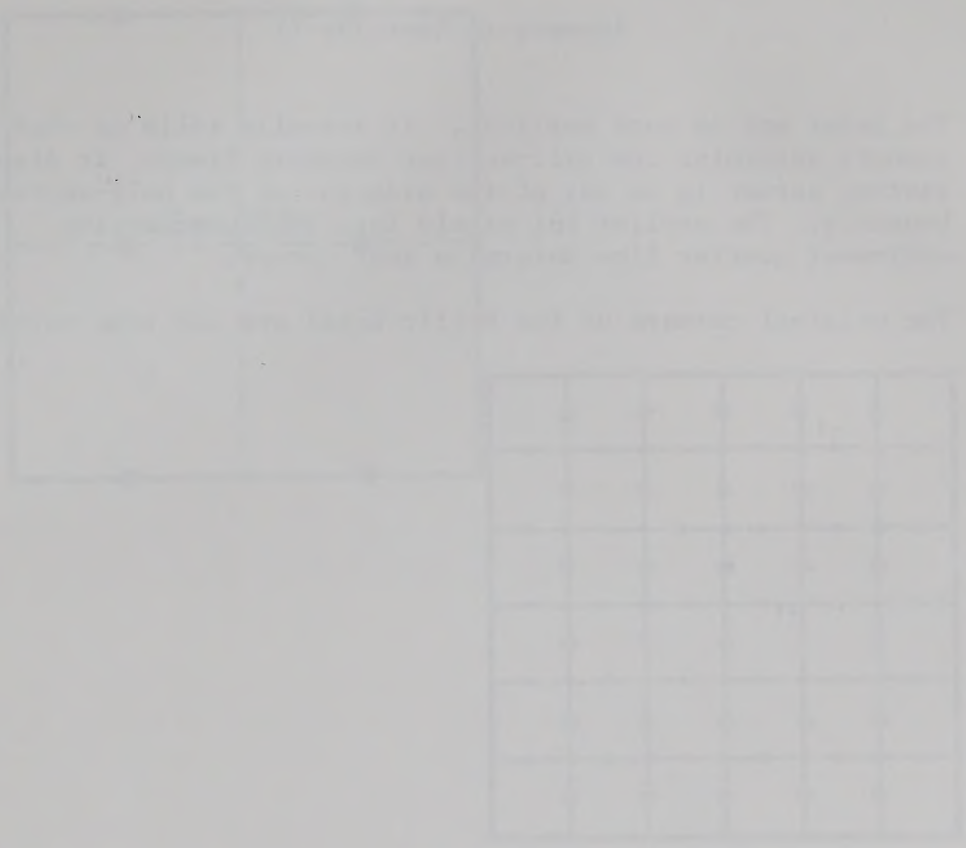
5. The original surveyor chaining through heavy brush with a worn chain carried by cold, scared, untrained assistants returns the distance between two corners as 38.67 chains. The retracing surveyor measuring with EDM equipment between the same two corners returns 37.16 chains. Which is the true length?

ACTS OF APRIL 24, 1820 and APRIL 5, 1832

6. State the two principles from the Act of 1805 which, according to these two Acts, govern the subdivision of quarter sections.

7. On the sketch, mark the interior corners called for in the Act of April 24, 1820, but not provided for in previous Acts.

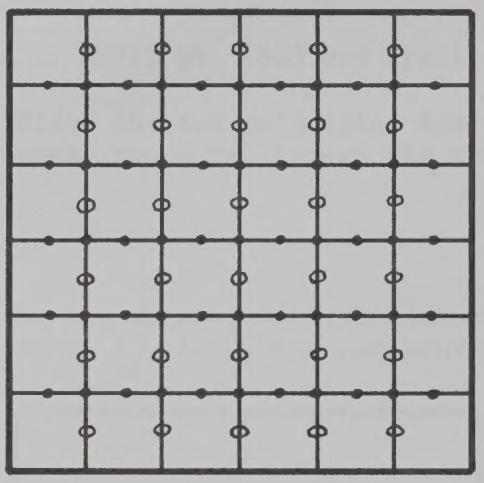




Answers to Exercise II

1. The later Act is more explicit. It actually tells us what corners determine the half-section boundary lines. It also adds another corner to be set at the midpoint of the half-section boundary. The earlier Act wisely lets the intersecting east-west quarter line determine that corner.

2. The original corners of the Public Lands are the true corners.

3. 

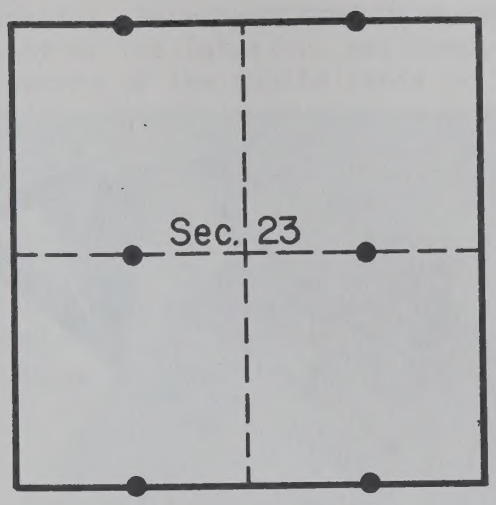
4. Nothing. It makes no separate provisions for such corners.

5. By statute, the original surveyor's 38.67 chains. By measurement, neither, if true means exact. Only counting measurements are exact.

6. 1) Corners not already marked are to be placed as nearly as possible equidistant from the two corners which stand on the same line.

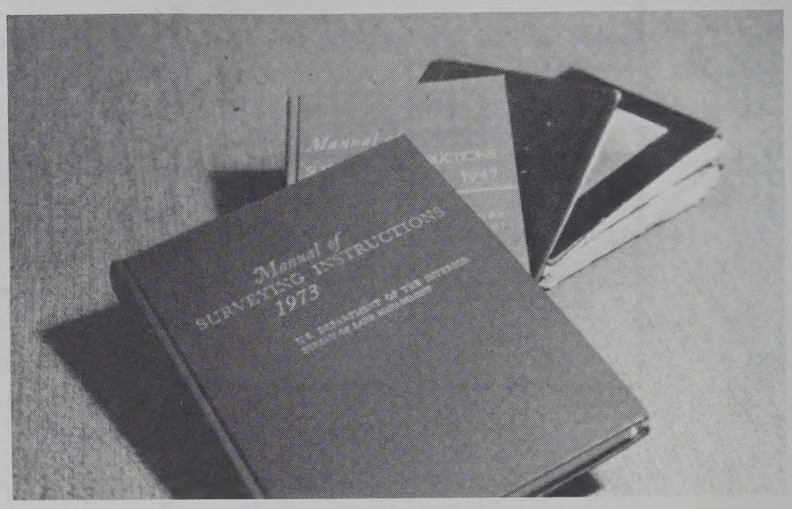
   2) Boundary lines not already run are determined by running straight lines between opposite corresponding corners.

7.

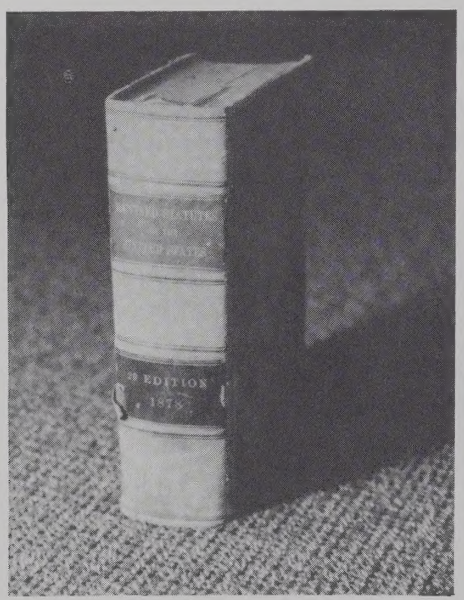


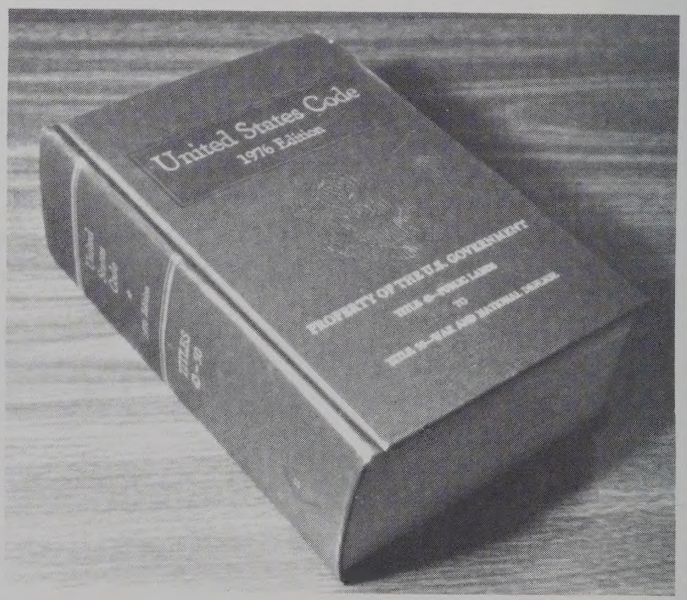
III. STATUTES AND INSTRUCTIONS

General instructions from various Surveyor-Generals, beginning with Tiffin in 1815, gradually evolve in 1855 into the first Manual of Instructions for surveying all the public lands. Revisions appear in 1881, 1890, 1894, 1902, 1930, 1947, and 1973.



The Bureau of Land Management is authorized by law to make certain rules and regulations to put into effect the land laws of the United States. The various Manuals of Surveying Instructions set forth what these rules are and were. In effect, the Manual is a statement of laws and policies applicable to most Federal lands. Using double proportion is a policy, not a statute law; setting the corner of a section by connecting opposite quarter-corners is a Federal statute law, not a policy. (Brown, C. M., 1969, p. 198-9).



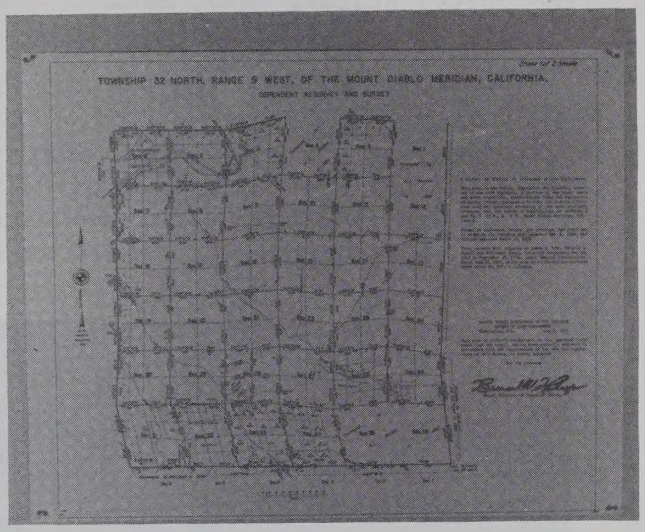


All the acts of Congress relating to subdividing sections are summarized in Sections 2396 and 2397 of the Revised Statutes, and in Sections 752 and 753, Title 43 of the United States Code.

The Director, Bureau of Land Management, under the supervision of the Secretary of the Interior, has complete jurisdiction over the survey and resurvey of the public lands of the United States.

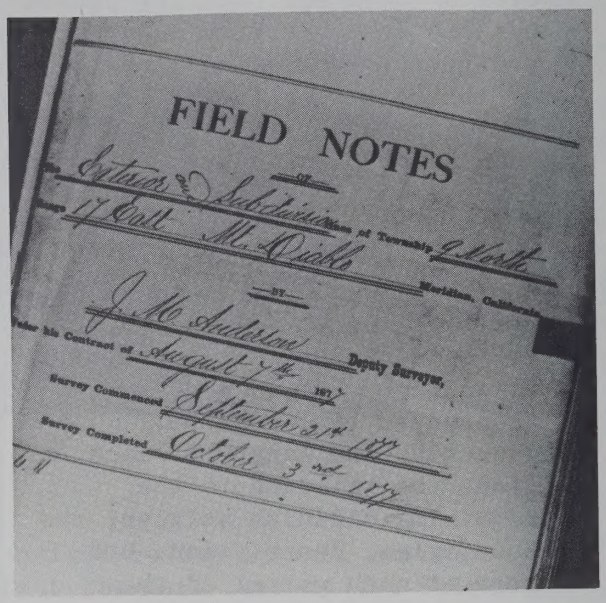
After title to a piece of land is granted by the United States, jurisdiction over the property passes to the State; the Federal Government retains its authority only with respect to the public lands in Federal ownership. Where the lands are in private ownership it is a function of the county or local surveyor to restore lost corners and to subdivide the sections. Disputes concerning these questions must come before the local courts, unless settled by joint survey or agreement. (Supplement to Manual of Surveying Instructions, 1975, p. 1).

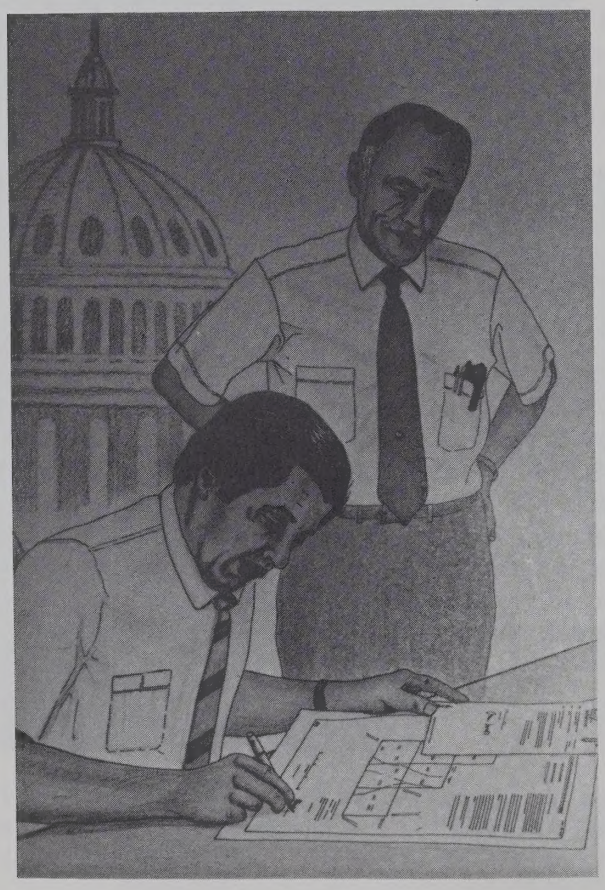
The plat is the drawing which represents the lines surveyed, established, retraced, or resurveyed, showing the direction and length of each line; the relation to the adjoining official surveys; the boundaries, description, and area of each parcel of the land; and, as far as practicable, the topography, culture, and improvements within the limits of the survey. Occasionally the plat may constitute the entire record of the survey. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 9-1).



It has been the policy of the Government to make no disposition of its public lands until after they have been surveyed and a plat of the survey has been filed with and approved by the Bureau of Land Management (formerly the General Land Office) of the Department of the Interior. When the lands are thereafter granted, the plat is a part of the patent or deed and binds all parties as to the boundaries of the land conveyed, to the same extent as would be the case if the descriptive features of the plat were set forth in the patent. (Shalowitz, 1964, p. 446).

The function of the cadastral surveyors of the Bureau of Land Management has been fulfilled when they have executed and monumented their surveys properly and returned an official record in the form of detailed field notes and a plat. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 3-75).





The public lands are not considered surveyed or identified until approval of the survey and filing of the plat in the administering land office by direction of the Bureau of Land Management. No subdivisions are to be "disposed of" until so identified. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 9-3).

Exercise III

1. What section of the revised statutes directs where quarter-section corners are to be placed?

2. What section and Title of the U.S. Code instructs on how to divide a quarter section in half?

3. Place in order--oldest to youngest--the following branches of the Federal Government: Interior; Federal Grazing Service; BLM; Treasury; General Land Office.

4. Let us assume that state law states that where the north quarter-section corner was not set, the north-south center line is to be run parallel to the east section boundary. You are surveying acquired lands. Will you follow state or Federal law?

Answers to Exercise III

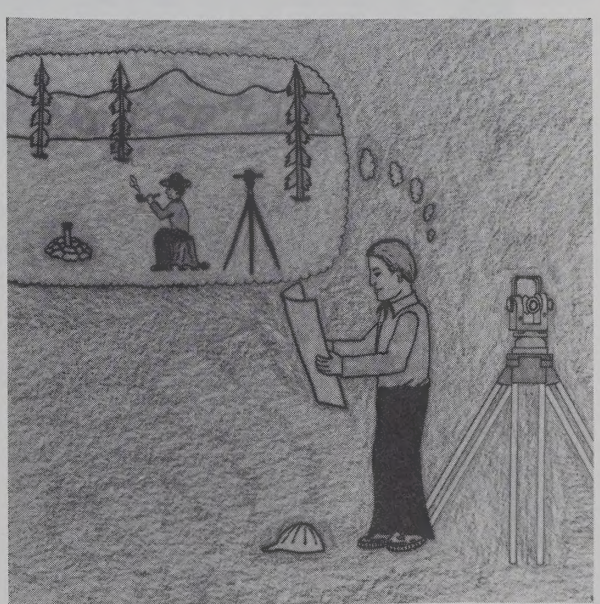
1. Section 2396
2. Section 753, Title 43.
3. Treasury; General Land Office; Interior; Grazing Service; BLM.
4. Do not worry about which law. "Protect the plat."

IV. SUBDIVIDING THE SECTION INTO QUARTERS

Step 1. Corners established in the original survey must be identified or restored. (Course No. 9600-ST-18, Corner Point Identification, and Course No. 9600-ST-22, Restoration of Lost Corners.)

Remember: (1) The boundaries of the public lands, when approved and accepted, are unchangeable. (2) The original township, section, and quarter-section corners must stand as the true corners which they were intended to represent, whether in the place shown by the field notes or not.

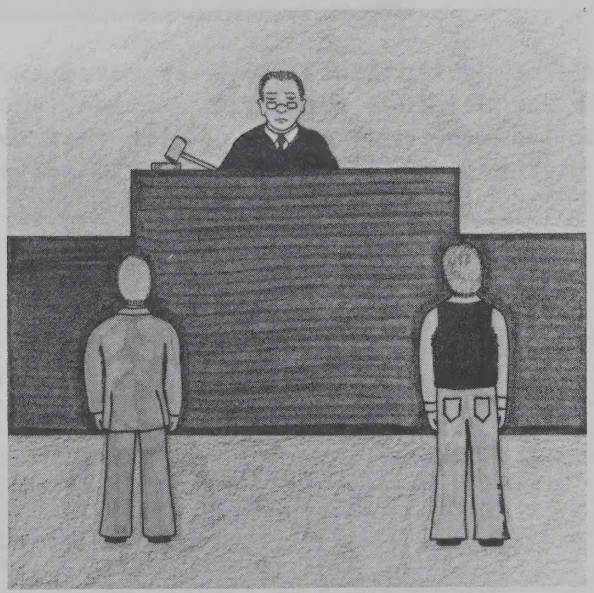
Step 2. After careful study of the field notes, the original section boundaries are retraced "following in the footsteps of the original surveyor."



In the General Instructions to His Deputies by the Surveyor-General of the United States for the States of Ohio, Indiana, and Michigan, 1850, is found the following directive:

> Each range of townships should be made as much over six miles in width, on each base and correction line, as it will fall short of the same width where it closes on to the next correction line north...

This is an instance of a directive that differs from the usual instructions given to deputies of that era. Retracing surveyors who read the instructions pertinent to their surveys are better prepared to follow in the footsteps of the original surveyors than those who know only the current manual. They should always keep in mind, however, that unusual instructions, because they were unusual, may have been disregarded or forgotten by the original surveyors.

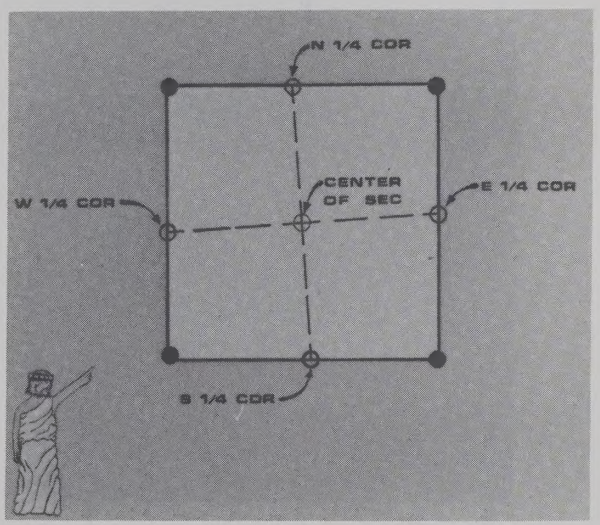


The duty of the surveyor is to locate the lines exactly as run by the original surveyor, and to gather sufficient evidence so that a judge and jury can be convinced that the reestablished line is the original line run by the original surveyor. (Brown, C. M., 1969, p. 200).

The bearings and distances that present-day surveyors develop in their retracements will differ from those of the original. Advancements in equipment and techniques may lead them to believe that their work is better than the original surveyors'. But in the eyes of the law that simply isn't true.

It is their own bearings and distances that present-day surveyors will use in their subsequent subdivision because their work depends on the state of the art at their particular time and place, just as did the work of the original surveyors. It is the original surveyors' returns, however, that are presumed to be correct and it is in light of these returns that present-day surveyors must interpret their own work. As we have seen, present-day surveyors reconcile the differences between their measurements and the original mathematically by applying proportion. In effect, they are holding the measurements of the original surveyors by changing their own units of measurement.

Step 3. The actual subdivision process is begun by running half-section boundary lines between opposite corresponding quarter-section corners.

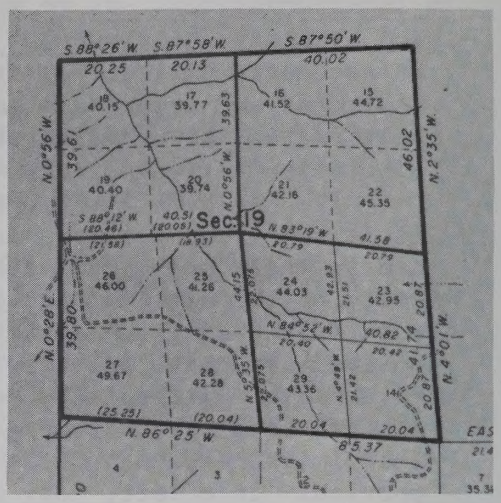


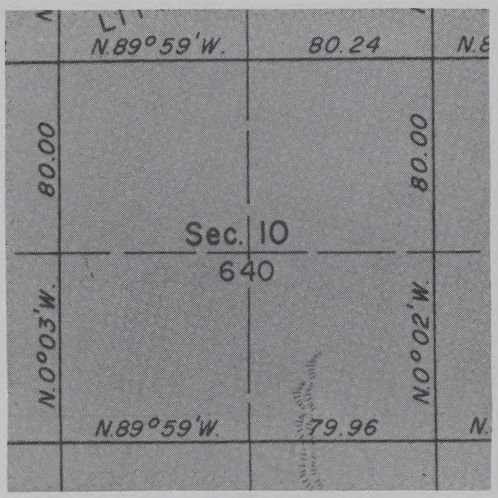
When fragmentary surveys are being extended, it is sometimes found that sections have been returned as partially surveyed. The surveyor is then compelled by law to complete these sections in such a way that any acquired rights are protected.

If a quarter-section has gone to patent under a previously accepted plat, the interior corner of that quarter may determine the section center lines rather than the opposite quarter-section corners that had not been established at the time of patent.

If such patented lands have reverted to the government, then there are no rights that need protection.

Section 19 in the sketch is an example of a section whose center lines were not determined by opposite corresponding quarter-section corners but by the necessity to protect the patented NW 1/4.

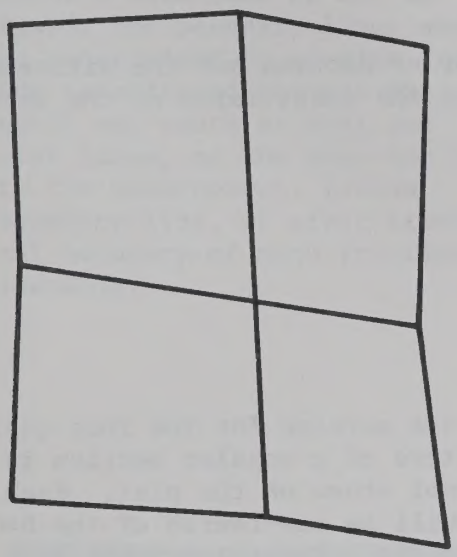




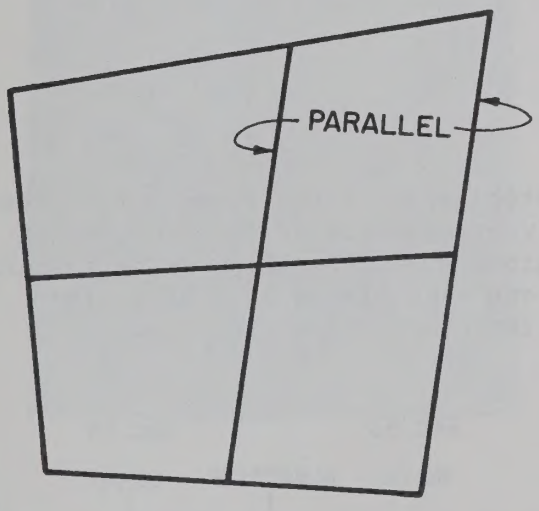
The intersection of these half-section boundaries uniquely determines the center quarter-section corner and divides the section into four parts. If the section is regular, the parts are aliquot and are called quarter-sections.

Sections were not always so subdivided even by the deputy surveyors under direction of the General Land Office. The following sketches indicate the various ways sections were subdivided in the 1850's:

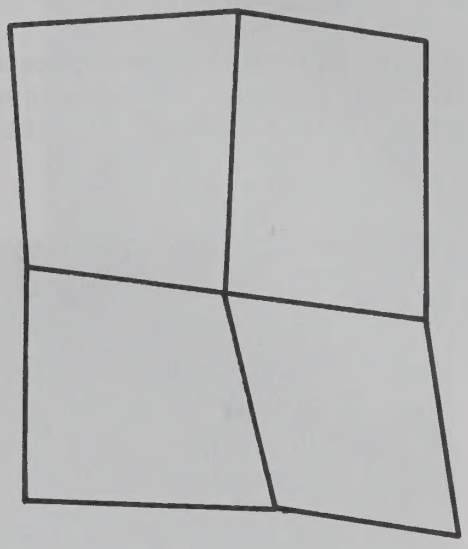
Act of 1805.



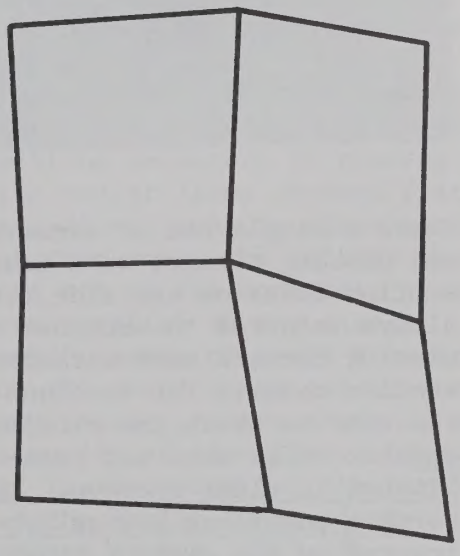
Instructions of the Surveyor-General for Illinois and Missouri, 1856, where N 1/4 was not usually set.



Instructions of the Surveyor-General for Illinois and Missouri, 1856 (Regular Sections) and Wisconsin State Statutes, 1860.

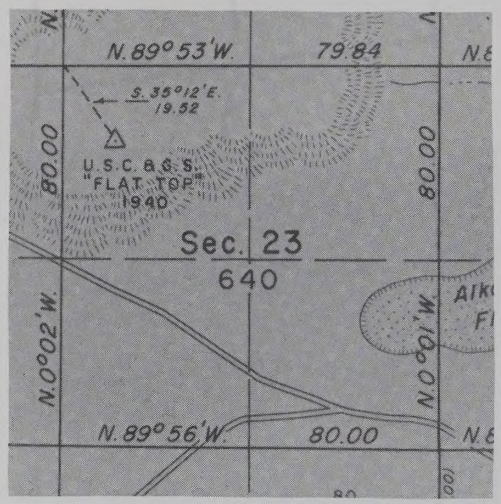


Wisconsin state statutes, 1855 and 1862.



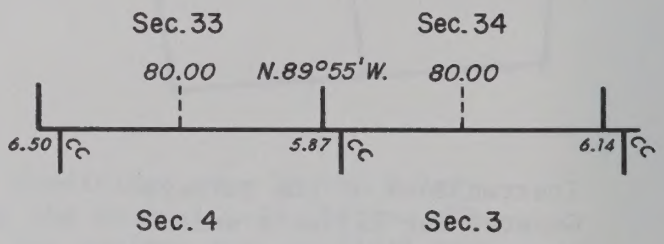
Once the Act of 1805 had directed how quarter-section boundaries were to be established and the original surveyor had set the exterior corners of a section, the boundaries of a section's subdivisions were fixed. Their location is no longer subject to the discretion of another surveyor, even though the restoration and setting of the actual governing monuments are very much a matter of the other surveyor's skill and judgment.

If the original surveyor sets the center of section and the sixteenth-section corners, then his corners govern the subdivision of the section even if he blundered in setting them.

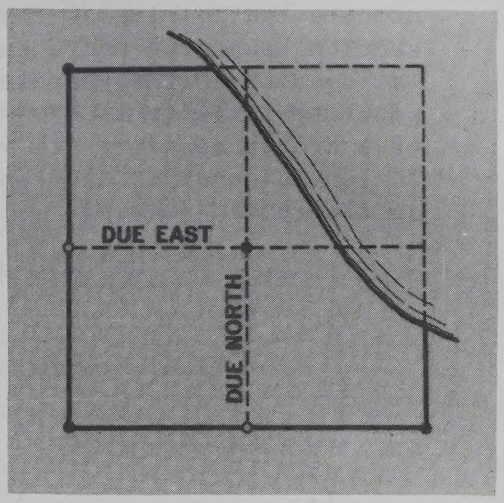


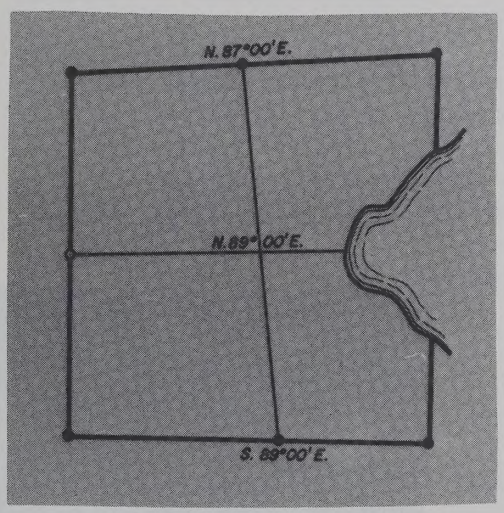
The acreage for the four quarters of a regular section is not shown on the plat. Each will be one-fourth of the 640 acres indicated for the section.

Where a single set of corners was established in the survey of a line and closing corners were subsequently established at intersection of section lines on one side...the original quarter-section corners nearly always referred to sections on only one side of the line after the closing corners were established on the other side. The quarter-section corners for sections on the side to which the closing corners refer were not established in older surveys. The correct positions are as protracted on the plat of those sections. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 5-35).



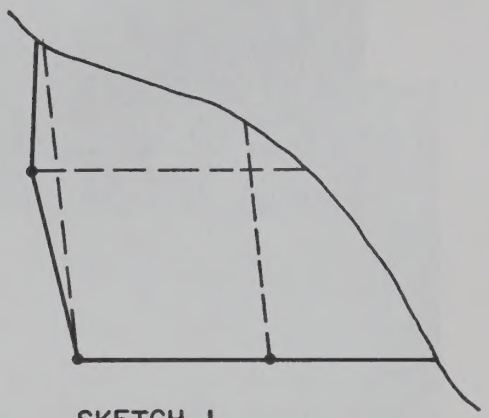
...in those portions of the fractional townships where no such opposite corresponding corners have been or can be fixed, the boundary lines shall be ascertained by running from the established corners due north and south or east and west lines, as the case may be, to the watercourse, Indian boundary line, or other external boundary of such fractional township...



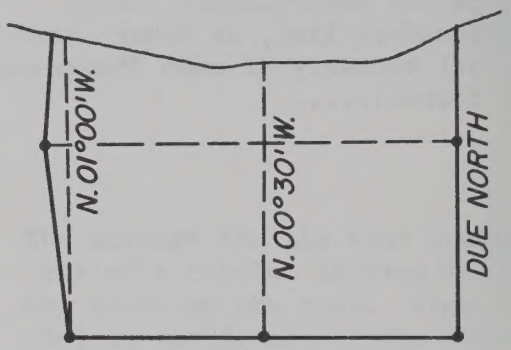


The law presumes that the section lines are due north and south, or east and west lines, but usually this is not the case. Hence, in order to carry out the spirit of the law, it will be necessary in running the center lines through fractional sections to adopt mean courses where the section lines are not on due cardinal, or to run parallel to the east, south, west, or north boundary of the section, as conditions may require, where there is no opposite section line. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 3-88).

It is not always so easy to decide on the mean bearing as it might seem. Sometimes, for instance, opposite boundaries are not straight in addition to not being parallel. The general practice is to first compute the bearing of the line determined by the end points of the section boundary, and then to use this computed bearing to determine the bearing of the "parallel" quarter boundary (Sketch 1), or to mean with the opposite section boundary (Sketch 2). Sometimes, the segments of a broken boundary are very unequal in length. Then the surveyor may decide to consider only one segment of the line or to give added weight to the longer segment.

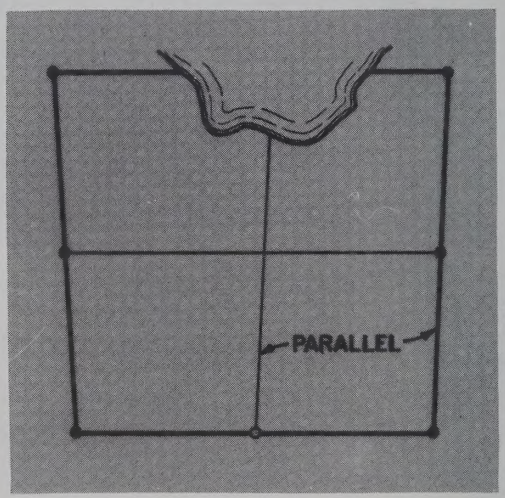


SKETCH 1



SKETCH 2

Until recently, Missouri Statute law read: "In subdividing a section made fractional by claims, grants, navigable water courses, lakes, impenetrable swamps or state lines, it shall be required to run parallel to the east and south boundaries thereof...provided, however, when there are no east and south boundaries, it shall be legal to run parallel to the north and west boundaries thereof."



As of September 28, 1979, new legislation was enacted in Missouri and now surveyors are required to follow Federal laws and regulations when subdividing sections.

Exercise IV

1. In restoring a lost quarter corner, today's retracing surveyors reconcile the differences between their measurements and those of the original surveyor by single proportion. How was this formerly done?

2. A quarter-section corner was never set by the original surveyor.

   a) What is the retracing surveyor's primary concern in positioning this corner?

   b) Where will the corner be set if the section is regular and no areas are shown for the quarter sections?

3. The plat distance between two corners is 38.75 chains. A retracing surveyor measures 39.62 chains between the same two corners. The law says the original distance is correct. The retracing surveyor's distance will be the same as the original distance if each of the retracing surveyor's chain lengths

   equal _____ chains. Then the retracing surveyor's
   (a)

   measurement of 39.62 chains will equal 39.62 x _____ =
   (b)

   _____ chains.
   (c)

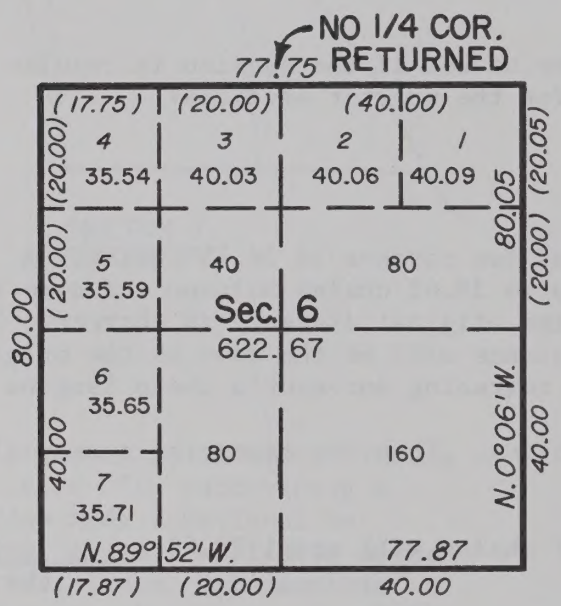
4. Can a section have more than one center quarter corner?

5. How would you restore a center quarter-section corner that was originally set according to a statute that called for the center of section to be set equidistant from the east and west quarter-section corners and also equidistant from the north and south quarter-section corners.

6. The north quarter-section corner in Section 6 has not been returned but the plat calls for it to be set 40.00 chains west of the northeast section corner. Note that the distance is given in parentheses; this indicates that the quarter corner has been located by protraction only.

Parenthetical distances were used to calculate areas and should be used to "protect the plat." In fact, the areas are primary and should be used to confirm the distances. Sometimes the distances are not given at all and the only way to arrive at them is to work back through the areas.

Use the method given in Sections 9-24 to 9-29 of the 73 Manual to see if you check the parenthetical distances given along the north boundary of Section 6.

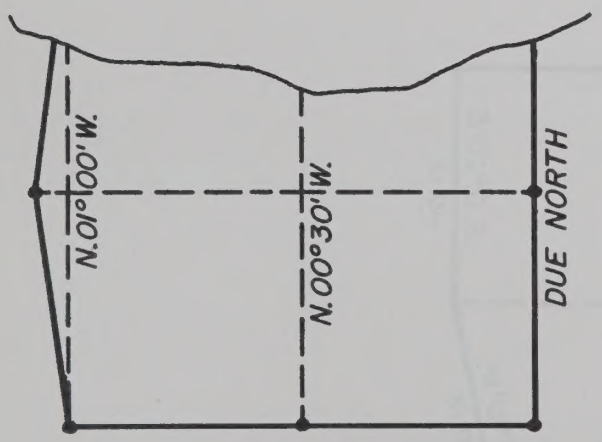


7. a) Which section lines in a township were intended to be cardinal in direction?

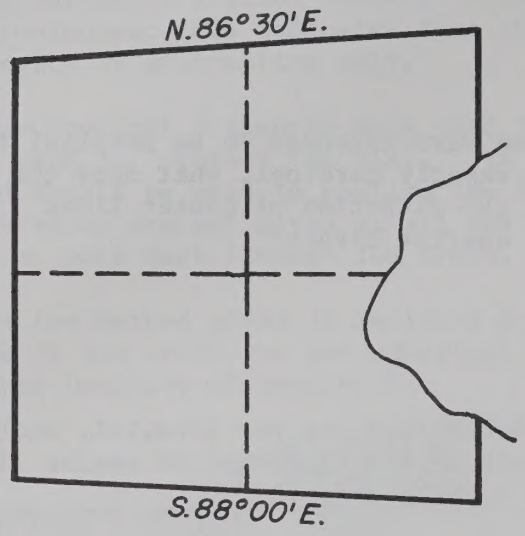
b) Since most section lines were intended to be parallel to each other rather than exactly cardinal, what does the 5th General Rule say about the direction of center lines controlled by only one quarter corner?

c) When opposite section boundaries are not parallel, what does the Manual suggest regarding the direction of center lines controlled by only one quarter corner?

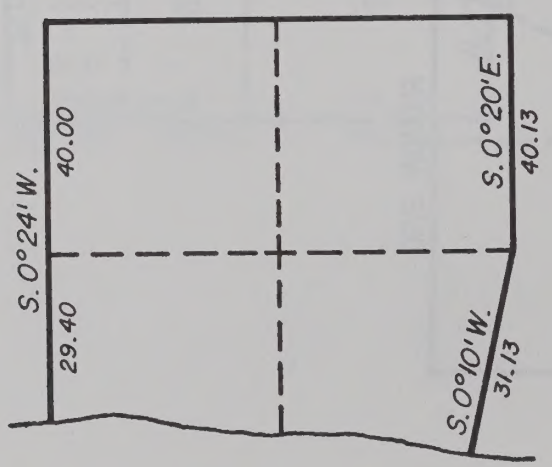
8. a) Justify for yourself the mean bearing given for the N-S center line in the sketch.



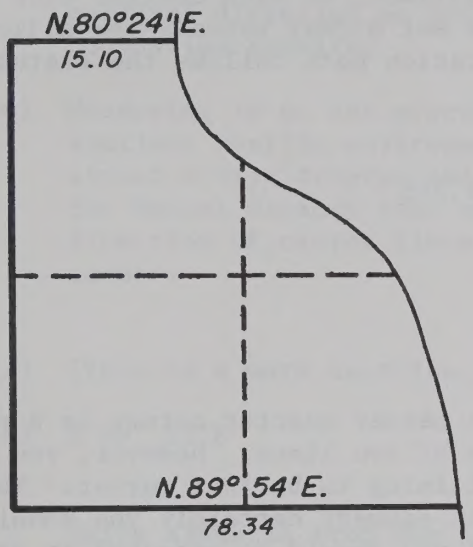
b) Compute the mean bearing for the E-W center line in the sketch.



9. Find the mean bearing of the N-S center line in the sketch. Follow the standard practice of first computing the bearing of the line determined by the end points of the broken east section boundary.



10. In the sketch, the opposite boundaries of the section are of decidedly unequal length. What is the mean bearing of the E-W center line if you give weight to the north and south section lines proportionate to their lengths? (Hint: Take the sum of the two lengths and the difference between the two bearings. Convert the latter to minutes. Then take the proportion that each length is of the sum of the lengths and multiply that times the difference in bearing.)



Answers to Exercise IV

1. By adjusting the chain.

2. a) To "protect the plat," i.e., to protect the rights of any patentees.

   b) The quarter sections are aliquot, so each quarter will be 160 acres. The corner will be set midway between the adjacent section corners. This location both follows the statute and protects the plat.

3. a) 0.978 $\quad \frac{x}{1} = \frac{38.75}{39.62} = 0.978$

   b) 0.978

   c) 38.75

4. No. By statute each section's center quarter corner is a point determined by the intersection of two lines. However, you may find more than one monument claiming to be that corner. What do you do then? There is no magic answer; certainly you should search the area diligently and you should be prepared to defend your choice if you disregard another surveyor's "corner."

5. Run lines between opposite quarter corners. At the midpoint of each line lay out a perpendicular line. Every point on each of these lines will be equidistant from a pair of quarter-section corners. One point, the intersection of the two perpendicular lines, will be equidistant from both pair of quarter-section corners -- the north and south quarter corners and the east and west quarter corners. This point will be the center quarter corner of the section. If you were doing this by double proportion according to the BLM Manual, the intersecting lines would be cardinal rather than perpendicular. Note that this is <u>not</u> the way to subdivide a section.

6. (This is a work exercise and has no answer.)

7. a) Meridional township boundaries were run as true meridians. Otherwise no section lines, except for latitudinal township boundaries which happened to be standard parallels, were actually intended to be cardinal in direction.

   b) The 5th General Rule acknowledges both the law and the pragmatic method of running section lines introduced by the early Surveyor-Generals by directing that center lines controlled by only one quarter corner be run in as nearly a cardinal direction as due parallelism with the section boundaries permits.

   c) Measuring is an art practiced by fallible men in a real and somtimes hostile environment where two "parallel" lines almost always diverge and sometimes widely. In such cases the Manual directs that mean courses be used to determine the direction of center lines controlled by only one quarter corner.

8. a) (This is a work exercise and there is no answer.)

   b) N 89° 15'E

Using azimuths from the north:

N 86° 30'E = 86-30

S 88° 00'E = 92-00

2|178-30 = 89-15 = N 89° 15'E

9. S 0° 09'W

East Boundary		S	E	W
S 0° 20'E	40.13	40.129	0.233	
S 0° 12'W	31.13	31.13		0.109
		71.259	0.124	

Bearing of East Boundary - S 0° 05' 59"E
Bearing of West Boundary - S 0° 24'W

MEAN BEARING - S 0° 09'W

10. N 89° 22'E

$15 + 78 = 93$

N 89° 54'E - N 80° 24'E = 9° 30' = 570'

$\frac{15}{93} \times 570 = 92' = 1° 32'$

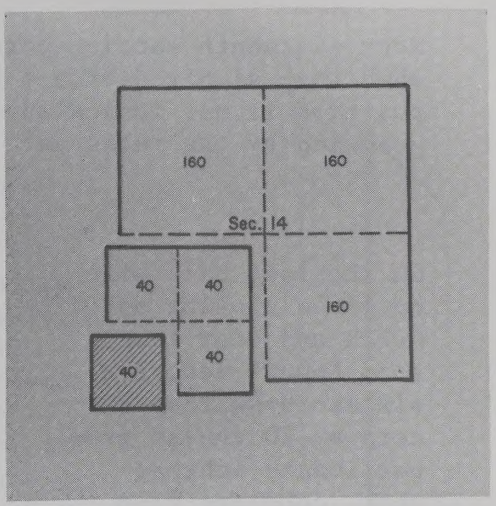
$\frac{78}{93} \times 570 = 478' = 7° 58'$

N 89° 54'E - 1° 32' = N 88° 22'E

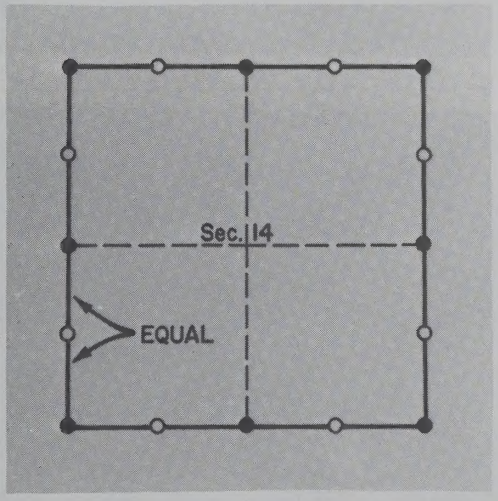
N 80° 24'E + 7° 58' = N 88° 22'E

V. SUBDIVIDING QUARTER SECTIONS

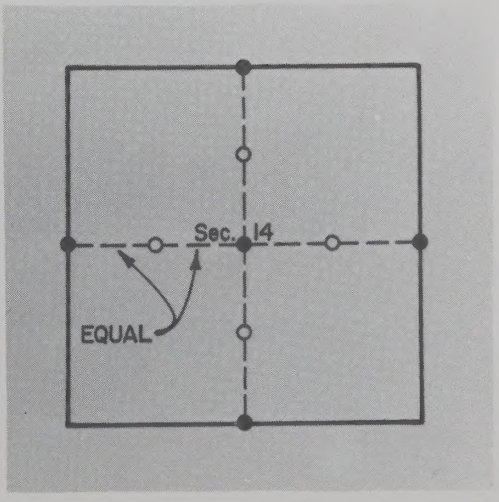
Forty acres! A quarter of a quarter of a section. Recall how in 1832 Congress had made available to early day settlers public land in a size they could afford.



Then, as now, procedures for further subdividing regular sections were very simple.



1. On the section boundaries, set corners on line and midway between section and quarter-section corners.

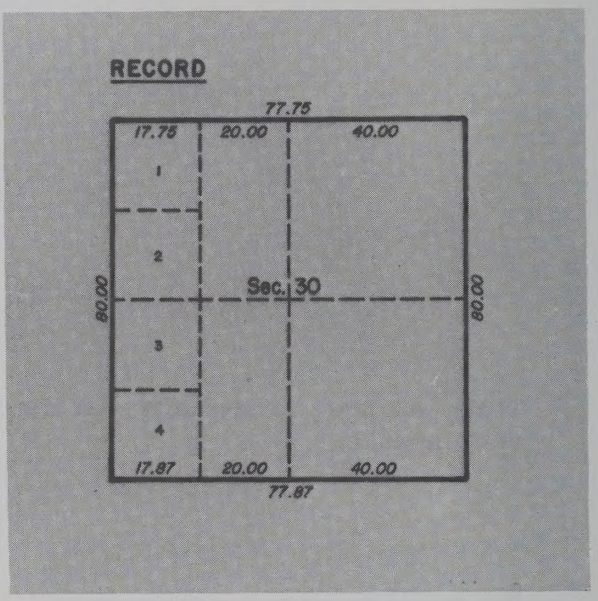


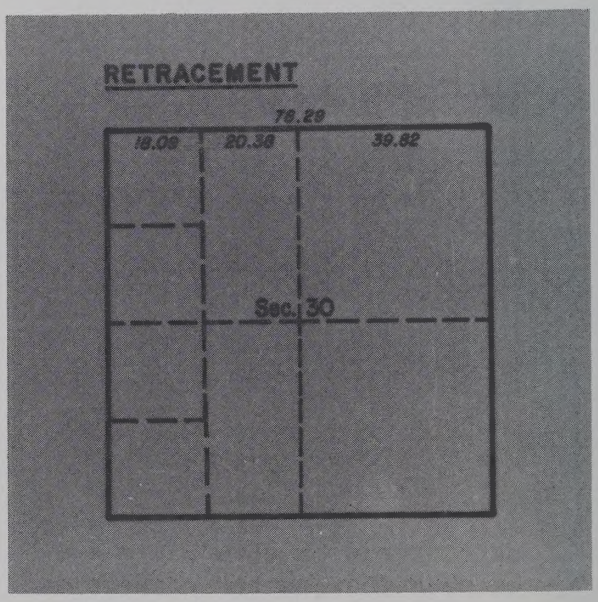
2. On the section center lines, set corners on line and midway between the quarter corners and the center of section. Both sets of corners, exterior and interior, are called quarter-quarter or sixteenth-section corners since they enable the section to be divided into those fractions.

The position of sixteenth-section corners set in the original survey is a matter of record both in the field notes and on the plat, and their recovery and restoration follow the same rules as apply to quarter-section corners.

Most sixteenth-section corners, however, were not set originally, and when they simply divide a quarter-section into aliquot parts, their position is not indicated on the township plat. Their position is then governed by the rules set forth in the preceding section.

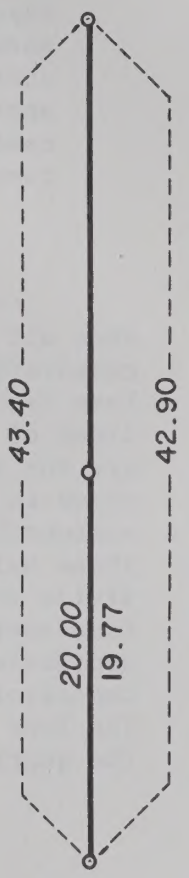
On the last half-mile of lines closing on north and west township boundaries, set sixteenth-section corners at 20 chains proportionate measurement, counting from the regular quarter-section corner. On lines between fractional or irregular sections, follow the same rule. Again, set sixteenth-corners at 20 chains proportionate measurement, counting from the last section or quarter-section corner.





When, as is usually the case in fractional and irregular sections, the position of sixteenth-section corners has been established by protraction, then the distances and areas indicated on the plat will govern the location of the monuments to be set. The plat must be "protected."

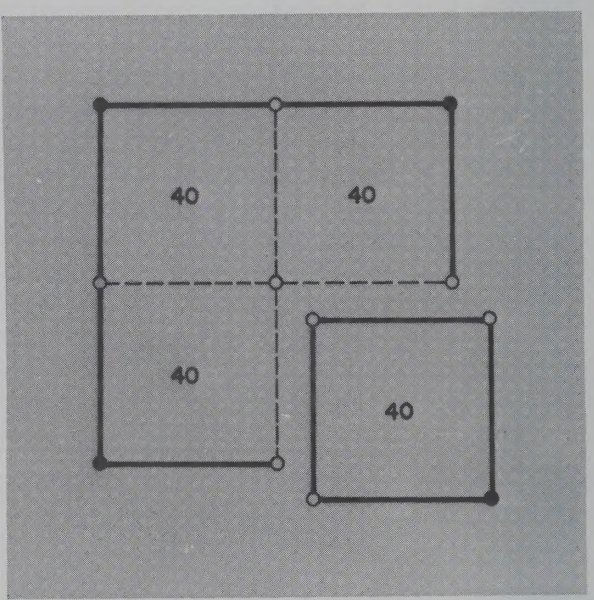
The shortage or surplus is distributed by proportion in establishing a sixteen-section corner. For example: The length of the line from the quarter-section corner on the west boundary of section 2 to the north line of the township, by the official survey was reported as 43.40 chains, and by the county surveyor's measurement was found to be 42.90 chains. The distance which the sixteenth-section corner should be located north of the quarter-section corner would be determined by proportion as follows: As 43.40 chains, the official measurement of the whole distance, is to 42.90 chains, the county surveyor's measurement of the same distance, so is 20 chains, original measurement, to 19.77 chains by the county surveyor's measurement. By proportionate measurement in this case the sixteenth-section corner should be set at 19.77 chains north of the quarter-section corner, instead of 20 chains north of said corner, as represented on the official plat. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 3-91).

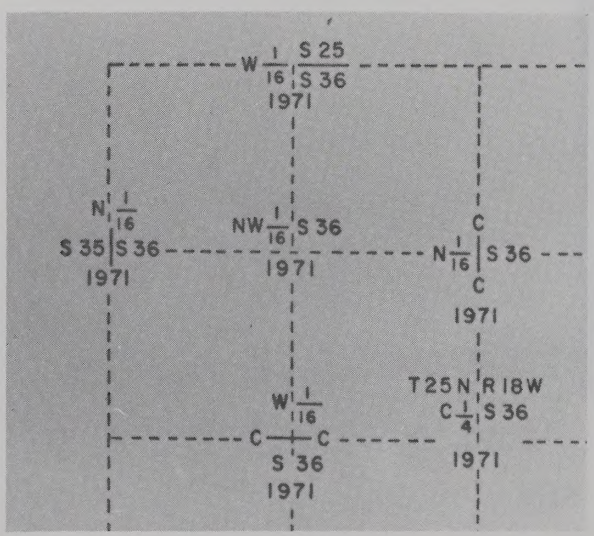


Any monument of the original survey found between a quarter-section corner and a section corner must be taken into account in determining the position of a lost sixteenth-corner.

> "An accurately established line tree," for example, as Clark says in his Law of Surveying and Boundaries (Sec. #21), "is a permanent monument of the first order and conclusively shows the true location of the line. The 1973 Manual (Sec. 5-18) says: "under the law a definitely identified line tree is a monument of the original survey. It properly is used as a control point in the re-establishment of lost corners by the appropriate method of proportionate measurement. In this case it is treated just as is a recovered corner, and it becomes an angle point of the line."

When all the sixteenth-section corners of a quarter-section have been set, then the center lines of the quarter-section are run straight between the opposite corresponding sixteenth-section corners. These half-quarter boundaries divide the quarter-section into four parts and their intersection uniquely determines the center of the quarter-section. The four parts are aliquot if the quarter-section is aliquot.





When a section is subdivided, the center quarter-section corner is monumented. When a quarter-section is subdivided, all sixteenth-section corners are usually monumented. The monuments are marked as indicated in Sec. 4-38 of the 73 Manual.

The General Land Office was not always consistent in its instructions for subdividing quarter-sections. For example, in the 1860's, Commissioners Wilson and Edmunds both held that "all lines subdividing a section must be straight lines running through the section from the corner of one boundary to its corresponding corner in the opposite boundary of said section."

Part of the field notes for the 1875 original survey of T.24 N., R. 19 E., 4th Principal Meridian, Wisconsin, follows:

East on a random line through N. 1/2 Sec. 36.
Var. 4° 40' E.

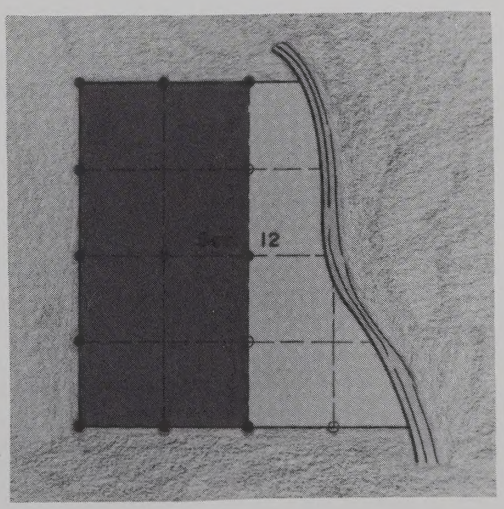
7.00	Top of ascent of 40 ft.
20.00	Set post for temporary 1/16 Sec. cor.
40.00	Set post for temporary 1/16 Sec. cor.
60.00	Set post for temporary 1/16 Sec. cor.
79.68	Intersect N. and S. line 2 lks N. of 1/16 Sec. cor. from which cor. I ran

N. 89° 59' W. on a true line through N. 1/2 Sec. 36.
Var. 40° 40' E.

19.92	Set post for 1/16 Sec. cor. from which...
39.84	Set post for 1/16 Sec. cor. from which...
59.76	Set post for 1/16 Sec. cor. from which...
79.68	1/16 Sec. cor.
	Surface rolling. Soil 3rd rate.

You will note that the sixteenth line through N 1/2, Sec. 36 is straight running to a point on the opposite section line, and that none of the interior sixteenth corners are set at the intersection of sixteenth lines.

In fractional quarter-sections, where no opposite sixteenth-section corner exists, the direction of quarter-section center lines is determined by the conditions represented on the official plat.

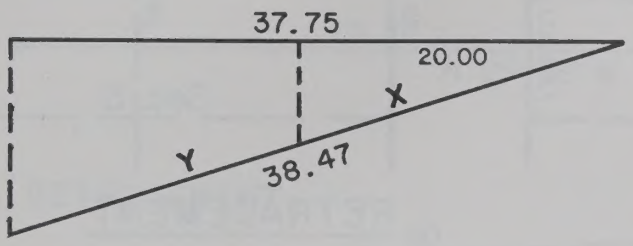


In surveying fractional sections, the subdivision lines are terminated at the meander line or other boundary, and a monument is set at the intersection of the two lines. This will require the restoration of the meander line or other boundary.

In the case of the meander line the monument set is called a special meander corner even though the intersection is not properly a corner of the subdivision, since the water course, not the meander line, is the boundary of the subdivision. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 3-115).

Exercise V

1. Check the computations in the sketch by computing the Y distance.

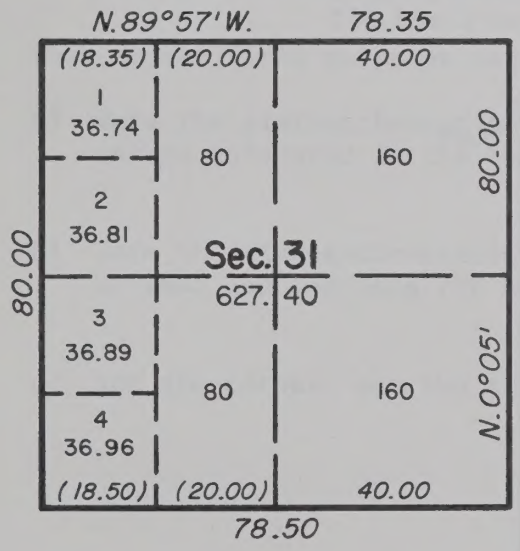


$$\frac{X}{20.00} = \frac{38.47}{37.75}$$

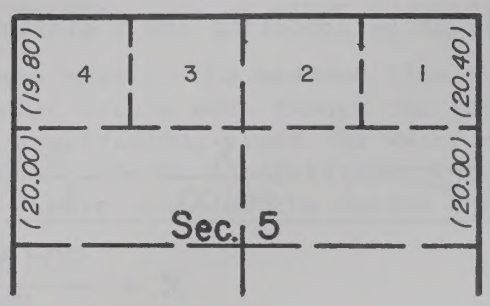
$$X = \frac{20(38.47)}{37.75}$$

$$X = 20.381$$

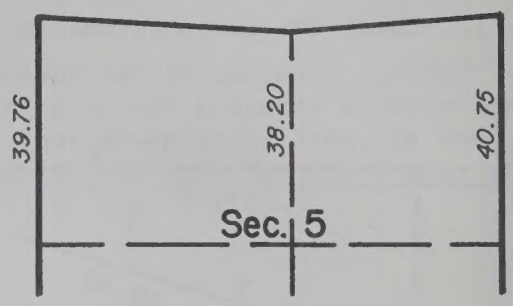
2. Where will you set the center west sixteenth corner of Section 31?



3. Where will you set the center north sixteenth corner of Section 5?

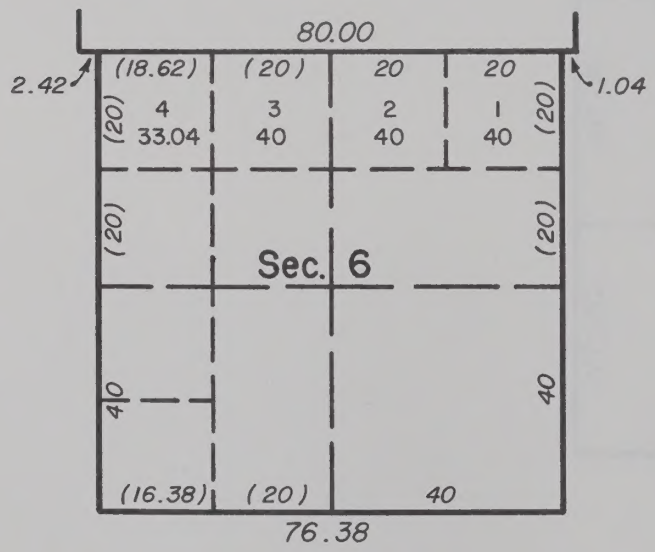


RECORD

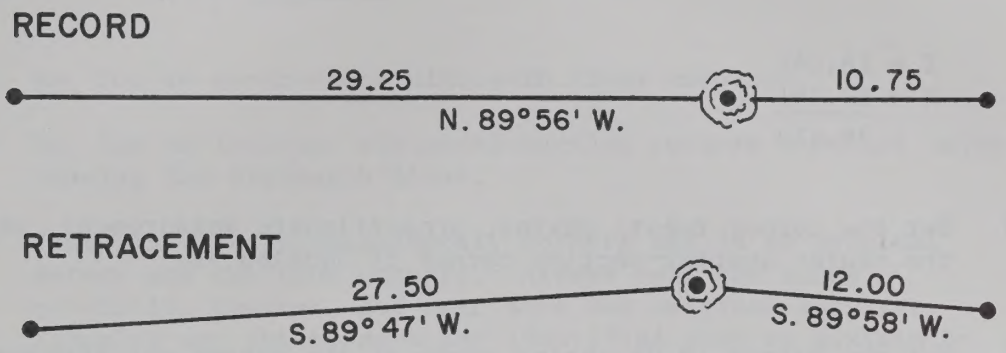


RETRACEMENT

4. Your retraced distance across the west half of the north boundary of Section 6 is 35.30. The ties to the closing corners are confirmed by the field notes. Where will you set the west sixteenth corner between Sections 6 and 31?



5. In a retracement survey of a regular section's north boundary you definitely identify a line tree that is confirmed by the field notes.



Will you consider the line tree in setting the sixteenth-section corner?

6. Look at the field notes on page 53 of the workbook.

   a) Were the sixteenth-section corners set according to the method advocated in the 1860's?

   b) Were the sixteenth-section corners set according to the Act of 1805 and Sections 752 and 753, Title 43 of the U.S. Code?

   c) Are the corners set the true sixteenth-section corners?

Answers to Exercise V

1. $\frac{Y}{17.75} = \frac{38.47}{37.75}$

$$\begin{aligned} Y &= 18.089 \\ X &= \underline{20.381} \\ &\quad 38.470 \end{aligned}$$

2. Set the corner twenty chains, proportionate measurement, west of the center quarter-section corner of Section 31.

3. Set the corner 19.05 chains north of the center quarter-section corner.

$\frac{X}{20.00} = \frac{38.20}{40.10}$; $X = 19.052$

$\frac{Y}{20.10} = \frac{38.20}{40.10}$; $Y = \frac{19.148}{38.200}$

4. The corner will be set at 20.00 chains proportionate measurement from the north quarter-section corner. Since we will be using 18.62 to compute our proportionate measurement, we first check to see if this distance confirms the area. We note immediately that in checking the distance across the north boundary we come up with 76.54 chains compared to the plat's 78.62 chains.

$$80.00 - 2.42 - 1.04 = 76.54$$

18.62 chains does not confirm the area of Lot 4 whereas 16.54 (76.54 - 60.00) does.

$$\begin{aligned} 18.62 + 18.04 &= 36.66 \neq 33.04 \\ 16.54 + 16.50 &= 33.04 \end{aligned}$$

Set the sixteenth corner on line between the quarter and section corners and 19.32 chains west of the quarter-section corner.

The Casebook discusses a similar problem on page A 1-11.

5. Set the sixteenth corner on line between the line tree and the quarter-section corner most certainly. As for setting it 9.25 chains proportionate measurement west of the line tree or midway between the section and quarter corner, it is suggested you read page A 3-5 in the Casebook.

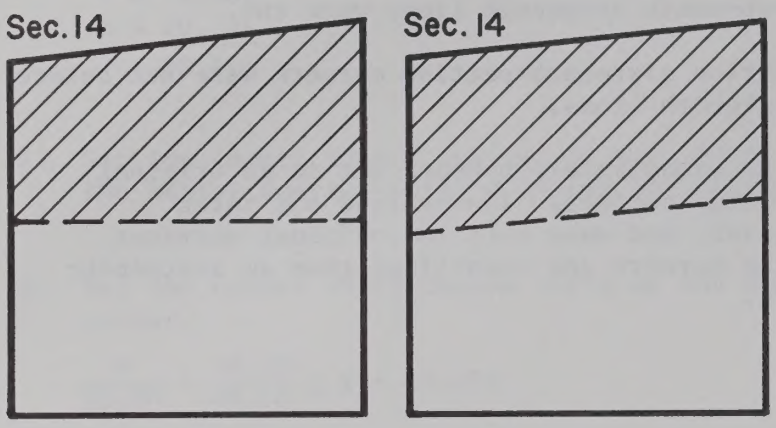
6. a) No, for no north-south sixteenth lines were run.

   b) No, for no interior sixteenth-section corners were set before running the sixteenth lines.

   c) Yes. The law is unequivocal; corners set in an original survey are the true corners. Always read the notes carefully, however, and make sure the original surveyor actually set the corners and identified them as sixteenth-section corners.

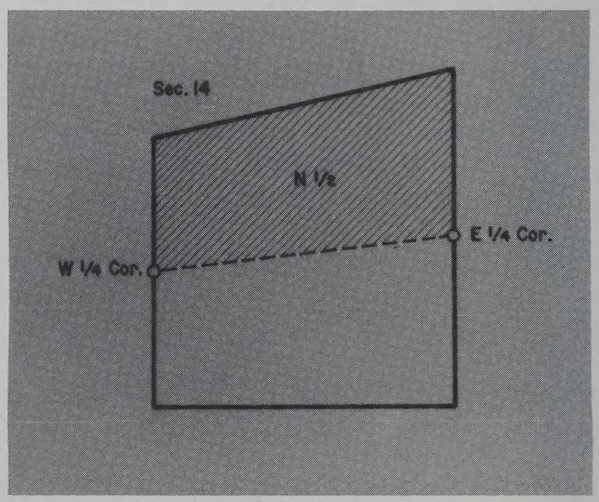
VI-A. DESCRIBING SUBDIVISIONS

How simple it is to locate and describe property in the U.S. Rectangular Survey System! Let us see why.



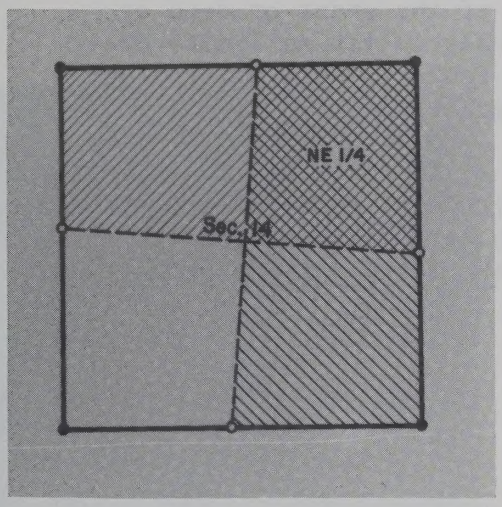
Which of the sketches correctly indicates the N1/2 of the section?

Of course, the answer is both if we're talking of mathematical division and neither if we mean according to the U.S. Rectangular System. Under that system, the division line between the N1/2 and S1/2 is the line joining the E1/4 corner and W1/4 corner and is defined by statute.



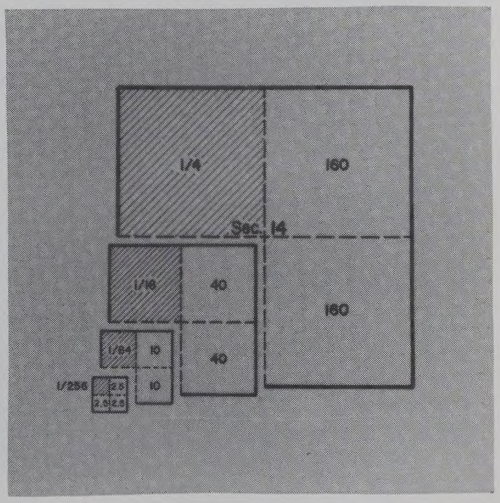
> And the boundary lines which have not been actually run and marked shall be ascertained by running straight lines from the established corners to the opposite corresponding corners (43 U.S.C. 752).

In sectionalized land when conveyances are made of a portion of a section, such as the west half, the conveyance is not based on acreage, but upon using the rule as given above. This is markedly different from conveyance under state laws where the west half of a lot in a subdivision conveys exactly one-half the area of the lot. The west one-half of a section is seldom if ever exactly one-half of the total area of the section. The rule for dividing a portion of a conveyance by acreage is based upon common law; whereas the rule for subdividing a portion of a section is based upon statutes of the Federal Government. (Brown, C. M., 1969, p. 237).



Quarter-sections and quarter-quarter-sections in the U.S. Rectangular System are defined in the same way, by statute. The description, NE1/4 for example, indicates that each quarter is the "intersection" of two halves, in this case the north and east one-half. The quarter-quarter or sixteenth-section is generally considered the smallest legal subdivision.

However, a decision of the Department of the Interior, 74 ID 394, reads: "Although it is often said that a quarter-quarter section (or a lot) is the smallest legal subdivision, this does not mean that subdivisions of a quarter-quarter section are not considered 'legal subdivisions' within the meaning of public land and mineral laws and regulations authorizing the leasing or other disposition of parcels of land less than 40 acres in size." Also... "The quarter section can further be divided into halves and into quarter-quarters which can be further subdivided into areas as small as 5 acres, or 2 1/2 acres, or 1 1/4 acres."



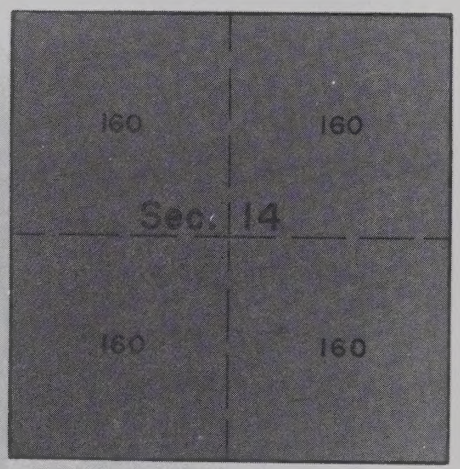
VI-B. SUBDIVISION BY PROTRACTION

The subdivision-of-section lines are usually run out in accordance with the official plat. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 7-9).

Boundaries protracted on the township plat control. In the case of Cragen v. Powell (128 U.S. 691, 696), the Supreme Court stressed the importance of the plat when it said:

> "It is a well settled principle that when lands are granted according to an official plat of the survey of such lands, the plat itself with all its notes, lines, descriptions, and landmarks, becomes as much a part of the grant or deed by which they are conveyed, and controls so far as limits are concerned, as if such descriptive features were written out upon the face of the deed or the grant itself."

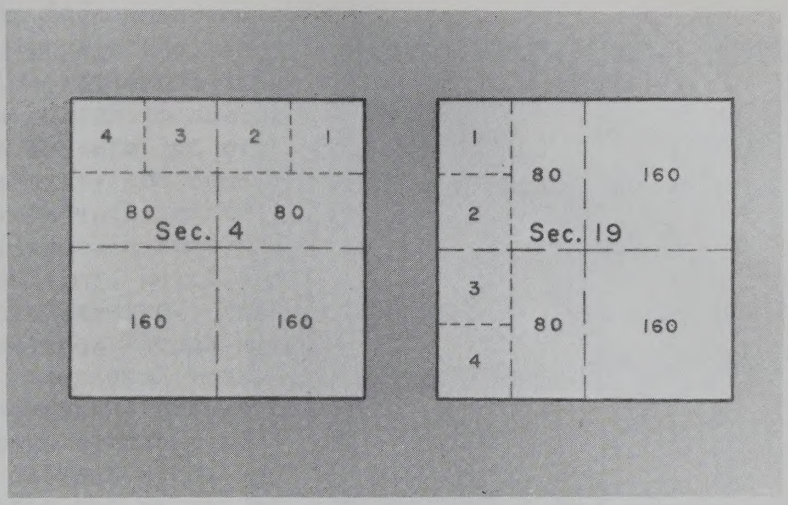
Unpatented lands can be re-platted and it is the new plat that governs the boundaries of subdivision lines. It is paramount that "the identity of the lands in which valid rights have been acquired be preserved." (Manual of Instructions for the Surveying of the Public Lands of the United States, 1973, Sec. 9-84).

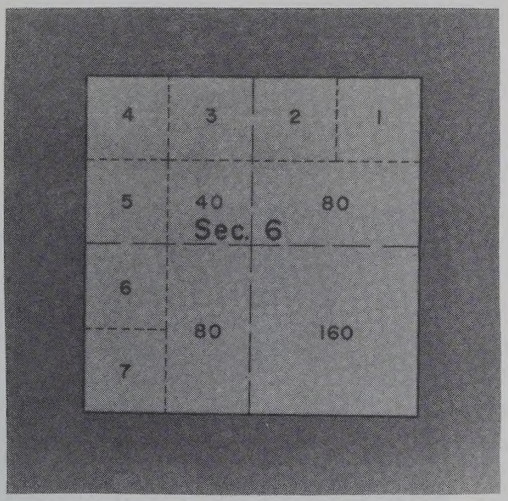


The township plat indicates by protraction the division of a regular section into four quarters. The boundaries are shown by broken straight lines connecting the opposite quarter-section corners and the divisions are always presumed to be aliquot parts.

The quarter-quarter sections are aliquot parts based on mid-point protraction but the boundaries are not indicated on the official plat.

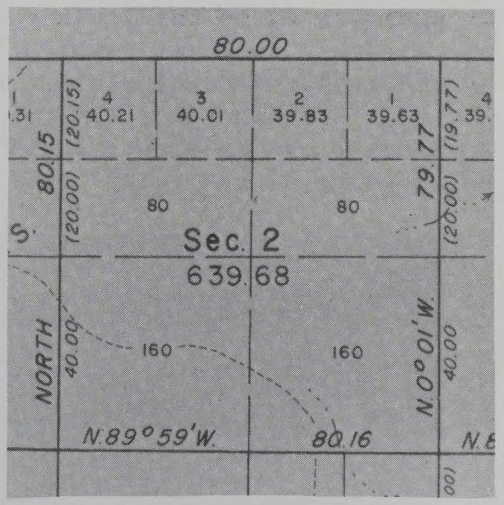
The sections bordering on the north or west boundary of a normal township, excepting section 6, are subdivided by protraction as shown.



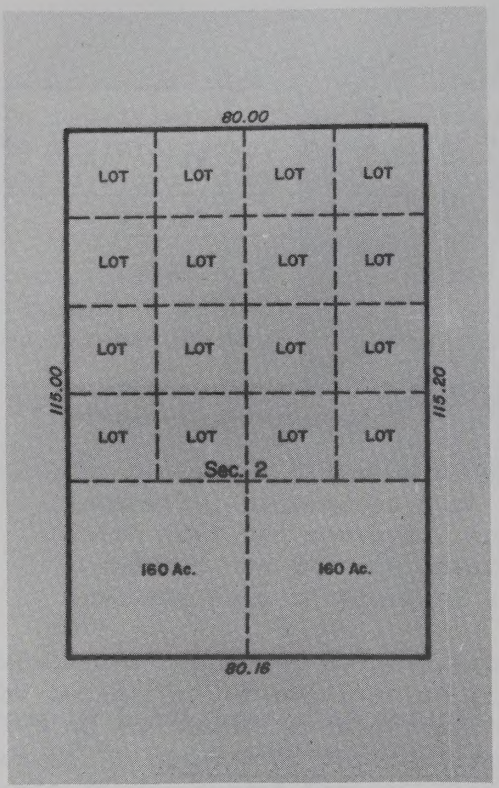


Section 6 is subdivided by protraction as shown.

The area of each regular section is shown on the plat as 640 acres and the area of aliquot parts is not shown. When a section contains one or more fractional parts, each fractional part shows an assigned lot number and an area computed to the nearest 1/100 of an acre. The remaining parts show the usual areas of 40, 80, or 160 acres, or sometimes simply no area at all.



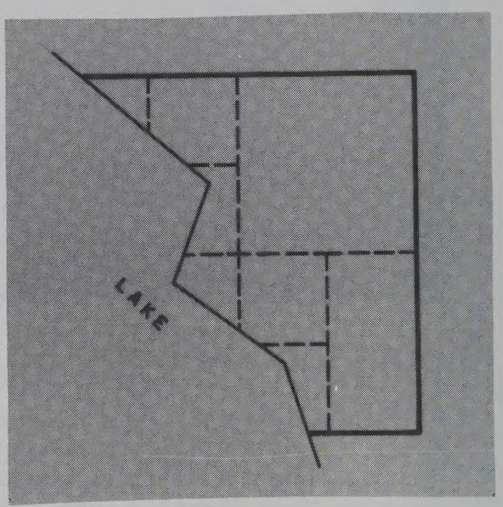
Dependent resurveys sometimes find the area of a subdivision to be different from that returned on the original plat. If the area differs by more than 5%, a new lot number and the new area are shown on the plat of the resurvey. Areas and designations of patented subdivisions are not changed, however. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 9-86).

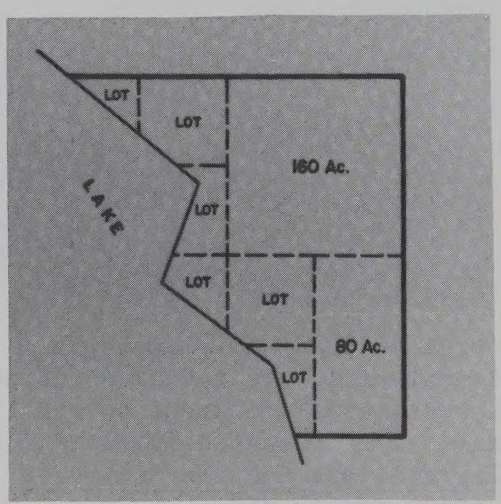


Elongated sections are those which because of their extra length require two or more tiers of lots adjoining the north or west boundary. Contrary to the standard practice of dividing a section into as many aliquot parts as possible, lotting is extended throughout the elongated half of the section.

Today, where possible, sections in excess of 120 chains are avoided by the creation of half-township or half-range numbers. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 3-83).

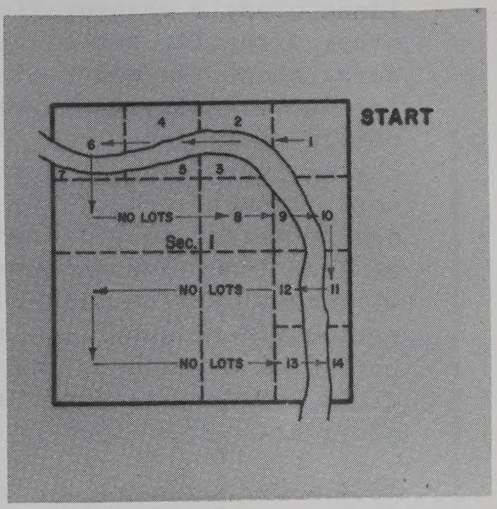
Sections which are invaded by meanderable bodies of water, or by approved claims at variance with regular legal subdivisions, are protracted into regular and fractional parts.

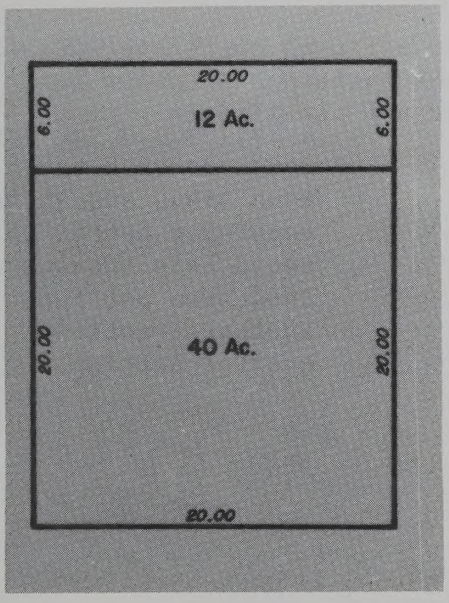




The fractional parts are called lots; their boundaries are subdivisions of section lines that are terminated by a meander line or claim boundary, but their location is determined as though the section had been completed regularly.

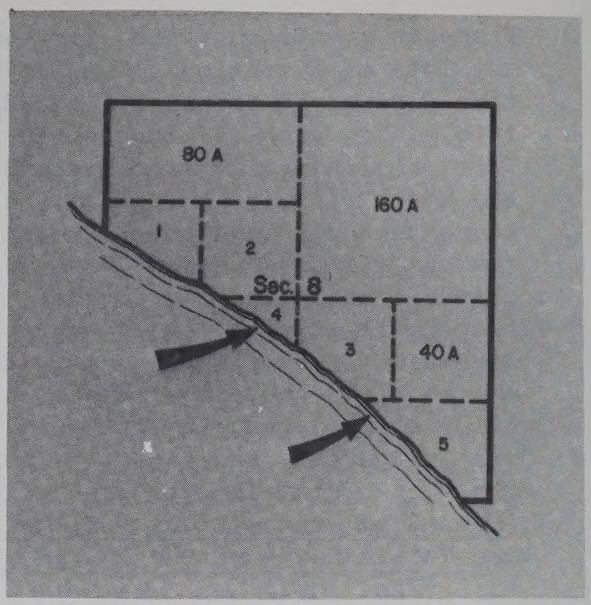
There is a uniform system for numbering the lots of a section. Imagine the section divided by parallel latitudinal lines into tiers, numbered from north to south. Then, beginning with the eastern lot of the north tier, call it No. 1, and continue the numbering west through the tier, then east in the second, west in the third, east in the fourth tier, until all fractional lots have been numbered. These directions are maintained even though some of the tiers contain no fractional lots. A lot extending north and south through two, or part of two tiers, is numbered in the tier containing its greater area. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Sec. 3-82).

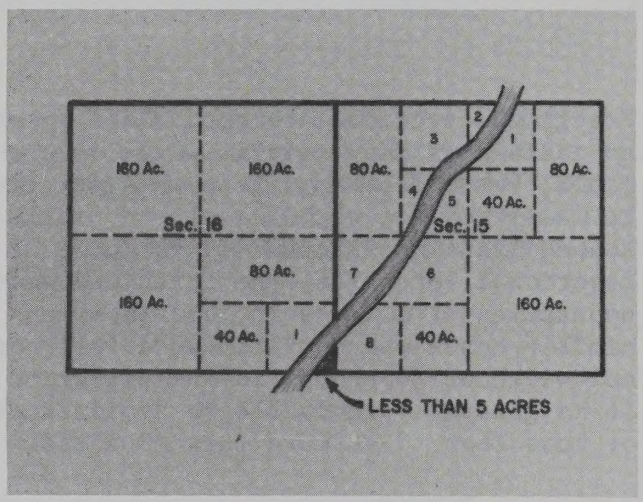




Fractional sections are subdivided so as to contain as many aliquot parts as possible, but a departure from this practice is made where it would result in poorly shaped fractional lots. In the case of fractional lots along the north and west boundaries of a township, and in other similar cases where a lot has a full normal width of 20 chains in one direction it is generally advisable to avoid areas of less than 10 or more than 50 acres.

In the instance of fractional lines along a meander line or other irregular broken boundary, where the width of the lot in both directions may be considerably less than 20 chains, resulting in tracts of more compact form, it is generally better to avoid an area of less than five or more than 45 acres. Extreme lengths or narrow widths should extend back from a meander line or claim boundary rather than along it.





A lot should not extend across a section line, and it is generally better to avoid lots that extend from one into another fractional quarter-section.

For a more extensive treatment of lotting, see Cadastral Plat Preparation, Reel 3, Course No. 9600-ST-17.

Exercise VI

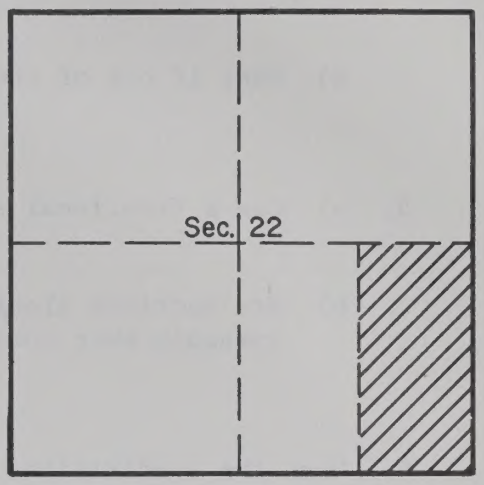
1. On the sketch,

   a) Describe the subdivisional unit that is cross-hatched.

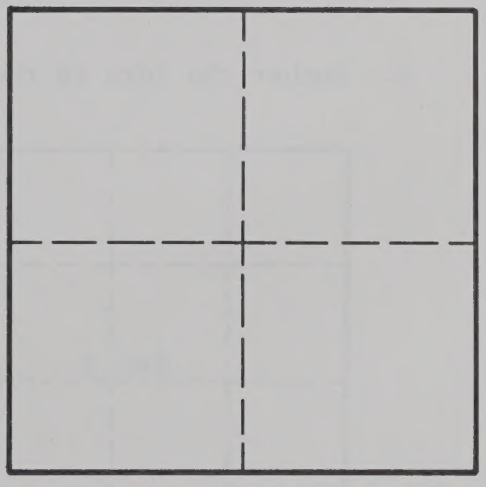
   b) Cross-hatch the SE 1/4 NW 1/4 of the section.

   c) Cross-hatch the E 1/2 SW 1/4 NW 1/4 NE 1/4 of the section.

   d) How many acres are there in (c)?



2. How would you describe an area all of which is contained in both the south one-half and the west one-half of a section?



3. If all measurements were perfect which sections of a township would you expect to contain less than 640 acres?

4. a) You have made a dependent resurvey and discovered that some areas are considerably different from those returned by the original surveyor. Do you return the areas as unchanged?

   b) What if one of the subdivision units is patented?

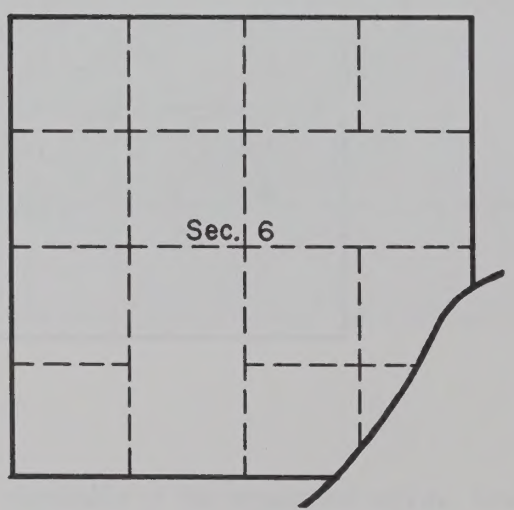
5. a) Can a fractional section contain more than 640 acres?

   b) Are sections along the north and west boundaries of a township ever considered fractional?

6. Were the subdivisions of an elongated section always designated as they are today?

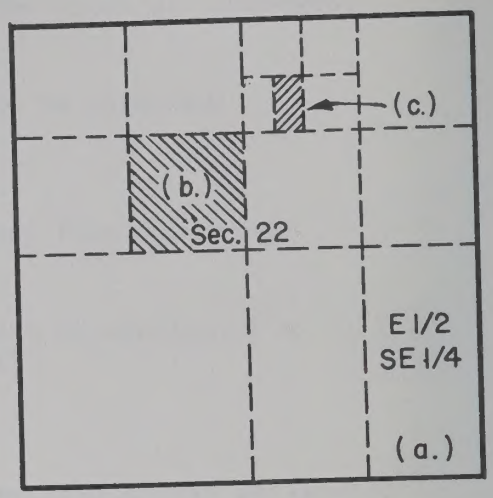
7. Why not extend lots across section or quarter-section lines?

8. Number the lots in the sketch.



Answers to Exercise VI

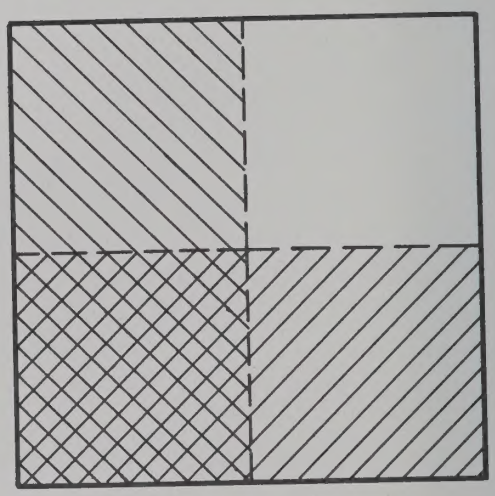
1. a), b), and c) - (See sketch.)



   d) 5 acres

   1/2 x 1/4 x 1/4 x 1/4 x 640 = 5

2. SW 1/4



3. Those sections along the west boundary of a township, due to the converging of meridians.

4. a) If areas differ by more than five percent, the latest area is shown and a new lot number is given. When the land is very valuable a figure much less than five percent might be used.

   b) The area and designation are not changed.

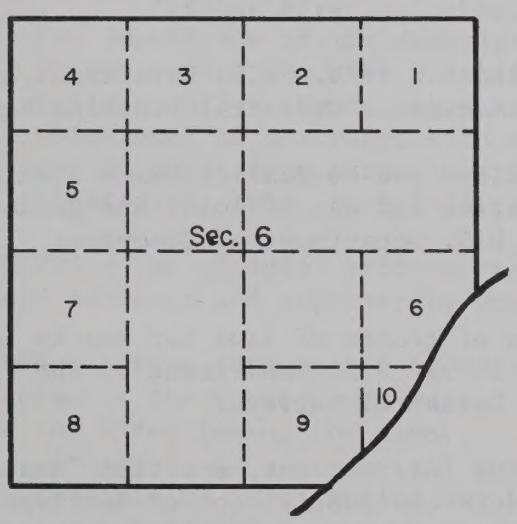
5. a) No. See the definition of a fractional section in the BLM Glossaries.

   b) Only if they contain less than 640 acres.

6. No. At one time the practice of designating as many aliquot parts as possible was followed.

7. Which section or quarter-section would you say that the lot was in?

8.



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GLOSSARY FOR SUBDIVISION OF SECTIONS*

ALIQUOT - Contained an exact number of times in another; a part of the measurement that divides the measurement without a remainder.

ALIQUOT PARTS - Legal subdivisions, except fractional lots, or further subdivision of any small legal subdivision, except fractional lots, by division into halves or fourths ad infinitum.

CORNER - A point on the surface of the earth, determined by the surveying process, which defines an extremity on a boundary of the public lands.

DEED - A document which transfers title to real property. In those instances where a complicated metes and bounds description is the only description available, a deed may be used to transfer fee-simple interest in public lands. A patent would be issued under normal conditions where a cadastral survey plat shows a description by legal subdivisions.

> An essential requirement of a deed is that the subject of the conveyance, the land itself, be fully described in order that it may be properly identified.
>
> The importance of the description has been recognized by the courts who have established that a deed to be valid requires, among other things, a thing granted, which must be described with sufficient clearness to set it apart from other things of the same kind (Shalowitz, 1964, p. 462-3).

FIELD NOTES - The official written record of the survey, certified by the field surveyor and approved by proper authority.

LINE TREE - A tree intersected by a surveyed line, reported in the field notes of the survey, and marked with two hacks or notches cut on each of the sides facing the line.

LOT - A subdivision of a section which is not described as an aliquot part of the section, but which is designated by number, e.g., LOT 2. A lot may be regular or irregular in shape and its acreage varies from that of regular subdivisions.

The term "government lot" is commonly used by persons outside the Bureau of Land Management in referring to such a subdivision of a section. "Lot" is also the name given individual parcels of recorded subdivisions of private tracts.

*Unless indicated otherwise all definitions are taken from the BLM Glossaries.

MONUMENT - A physical structure, such as an iron post, marked stone or tree in place, which marks the location of a corner point established by a Cadastral Survey. Objects, to be ranked as monuments, should have certain physical properties such as visibility, durability and stability, and they must define location without resorting to measurements. "Monument" and "corner" are not synonymous, although the two terms are often used largely in the same sense.

OFFICIAL SURVEY - A public land survey which has the field notes approved, the plat accepted, and has been filed in the proper BLM land office after publication in the Federal Register, if necessary. Only then can a subdivision of the public lands be conveyed or in anyway disposed of.

PARENTHETICAL DISTANCE - Distances noted on the plats in parentheses are those regular and fractional portions of lines constituting the boundaries of the quarter-quarter sections and fractional subdivisions bounded thereby. Parentheses are used where the record is not supplied by the field notes, indicating that the distance was not measured on the ground. The figures show what was used in the calculation of areas. The same lengths are to be adopted proportionately whenever there is a need for an establishment of sixteenth-section corners on the section boundaries, and for control points for the subdivision of sections.

PATENT - A document by which the United States conveys, to those entitled thereto, legal title to some portion of the public lands.

> When the Government transfers to an individual a part of the public lands it does so by means of a "patent." A patent is a document that vests in the transferee the complete legal title to the land transferred, or furnishes evidence of the transfer. A patent is necessary to pass a perfect legal title to public lands.
>
> The patent is, in form, a conveyance of the land, and corresponds to a "deed" when the parties to the conveyance are private individuals. When issued, the patent must be signed in the name of the President, either by himself or by his duly appointed secretary, sealed with the seal of the General Land Office (now the Bureau of Land Management), and countersigned by the recorder. (Shalowitz, 1964, p. 452).

PROPORTIONATE MEASUREMENT - A proportionate measurement is one that applies an even distribution of a determined excess or deficiency of measurement, ascertained by retracement of an established line, so as to give concordant relation between all parts; that is, the new values given to each of the several parts, as determined by the measurement, shall bear the same relation to the record lengths as the new measurement of the whole line bears to that record. It should be noted that the rule is not ordinarily applicable in treating gross error or blunder, if the latter can be definitely segregated.

PROTECT THE PLAT - The responsibility of the surveyor to examine, weigh and interpret the available evidence in respect to the execution of a resurvey, looking to the protection of the valid rights acquired under the original survey as shown by the plat. The bona fide rights of claimants are protected under the Constitution and the Act of March 3, 1909, as amended by the Act of June 25, 1910, and by provisions under the Act of September 21, 1918.

PROTRACTION - The word means extension or prolongation. An example of its use would be the representation on paper of the functional lots in the north and west tiers of sections within a township. These lines are not monumented on the ground. They are shown on the plat as protractions (dashed lines) indicating that they were not run in the field.

> Parcels of land or lots drawn upon a subdivision map but not monumented on the ground by an original survey are said to be created by protraction... In the sectionalized land system, sections are created by prior survey and monumentation; parts of sections are created by protraction. (Brown, C. M., 1969, Sec. 1:14, p. 29).

PUBLIC LANDS - The original public domain included the lands that were turned over to the Federal Government by the Colonial States and the areas acquired later from the native Indians or foreign powers. Insofar as public land surveys are concerned, "public lands" are those which, after inuring to the United States, have remained in public ownership, or, after private acquisition, have been returned to public ownership and the status of public land by law. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973).

RESURVEY - A term applied to the re-establishment or restoration of land boundaries and subdivisions by the rerunning and remarking of the lines that were represented in the field note record and on the plat of the previous official survey. This includes, as in the original survey, a field note record of the retracement data, observations, measurements and monuments descriptive of the work performed, and a plat that represents such resurvey, all subject to the approval of the directing authority. The above definition is intended or implied unless modified as in an "independent" resurvey or in some other appropriate manner. The adjective "dependent" applied to the term "resurvey" is for emphasis, and specifically suggests the recovery and restoration of the prior official survey.

RETRACEMENT - A survey made to ascertain the direction and length of lines and to identify monuments and marks of an established prior survey. Recovered corners are rehabilitated, but lost corners are not restored and lines through timber are not reblazed.

RETURNED - Areas and/or boundaries of the public lands which are described in the approved field notes and appear on the accepted plat of an official survey are said to be "returned."

SECTION, FRACTIONAL - A section, which in its original form, contained one or more subdivisions of less than forty (40) acres due to irregular exterior boundaries, or due to the encroachment of a meandered body of water or other land which could not properly be surveyed or disposed of as an aliquot part of that section.

> Sections are also frequently rendered fractional in closing the surveys on the north and west boundaries of the township because deficiencies in measurement caused by error of survey or convergence of meridians are placed in the half-mile closing against these township boundaries. (Definitions of Surveying and Associated Terms, 1972, p. 145).
>
> Sections which carry excess areas or lots over the regular division are sometimes called fractional. (Wattles, W.C., 1974, p. 301).

SECTION, REGULAR - A section which contains no lots but only aliquot parts. (Manual of Instructions for the Survey of the Public Lands of the United States, 1973, p. 194).

SUBDIVISION - (1) Subdivision of a township into sections. (2) Subdivision of a section into half-sections, quarter-sections, sixteenth-sections or sixty-fourth-sections, or into lots, according to the Manual of Instructions for the Survey of the Public Lands of the United States (1973). (3) The process of surveying such subdivisions. (4) In the private practice of land survey, subdivision is the division of any area into lots, streets, rights-of-way, easements and accessories, usually according to state law and local regulations. A particular aliquot part, lot, or parcel of land described according to the official plat of its cadastral survey.

SUBDIVISION, LEGAL - The subdivision of a township, such as a section, half-section, quarter-section, quarter-quarter, or sixteenth-section, or lotting, including the lot, section, township and range numbers and the description of the principal meridian to which referred, all according to the approved township plat.

SUBDIVISION, SMALLEST LEGAL - For general purposes under the public land laws, a quarter-quarter section or one lot. Under certain of these laws and under special conditions, applicants, claimants, etc., can select subdivisions smaller than a quarter-quarter section or lot.

SURVEYING INSTRUCTIONS - Various regions of the United States have been surveyed under amended or differing instructions from the passage of the first Land Ordinance to the present. The Ordinance of May 20, 1785, gave explicit cadastral survey instructions which were to be carried out under the personal supervision of the Geographer of the United States, Thomas Hutchins. His successor, Rufus Putnam, was given the title "Surveyor-General of the Northwest Territory" under the terms of the Act of May 18, 1796. He wrote letters of instruction to deputy

surveyors as did his successors, Jared Mansfield and Josia Meigs. In 1815, Edward Tiffin, who succeeded Meigs as Surveyor-General of Territories east of the Mississippi, issued the first signed and dated general instructions for the guidance of deputy surveyors, though they were partially based on an unsigned, undated manuscript prepared earlier by Mansfield. Other printed circulars followed.

The staff members responsible for this A/V program acknowledge and appreciate the contributions made by Theron Taylor, artist/photographer, and Rosini Russell, artist, both of Denver, Colorado.

CADASTRAL SURVEY
COOPERATIVE TRAINING